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APPENDIX TO THE JOURNALS

OF THE

SENATE AND ASSEMBLY

OF THE

FORTY-THIRD SESSION

OF THE

LEGISLATURE OF THE STATE OF CALIFORNIA

VOLUME IV

SACRAMENTO
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VOLUME IV.

1—Report of Oil and Gas Supervisor, 1916–1917.
2—Report of Oil and Gas Supervisor, 1917–1918.
3—Report of Superintendent of Public Instruction, 1917–1918.
4—Report of State Treasurer, 1916–1918.
5—Report of Building and Loan Association, 1917.
6—Report of Building and Loan Association, 1918.
7—Report of Department of Engineering, 1916–1918.
8—Report of Highway Commission, 1918.
9—Report of State Forester, 1916–1918.
10—Report of Department of Weights and Measures, 1917–1918.

BULLETIN No. 82

SECOND ANNUAL REPORT

OF THE

State Oil and Gas Supervisor of California

FOR THE FISCAL YEAR 1916-1917

Covering Operations of the Department of Petroleum and Gas of the State Mining Bureau

Submitted to
FLETCHER HAMILTON, State Mineralogist
by
R. P. McLAUGHLIN, State Oil and Gas Supervisor

DEPUTY SUPERVISORS
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W. W. THAYER, Secretary

CALIFORNIA STATE PRINTING OFFICE
SACRAMENTO
1918

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LETTERS OF TRANSMITTAL.

February 18, 1918.

To His Excellency, the Honorable William D. Stephens,
Governor of California.

Sir: I have the honor to transmit herewith Bulletin No. 82 of the State Mining Bureau, being the Second Annual Report of the State Oil and Gas Supervisor, relative to the work of protecting the oil fields from damage by infiltrating water.

The work of the Petroleum Department, which met with uniform success from the outset, has continued to expand during the past year and, as the pages of this report show, some notable results have been attained along the lines of practical conservation.

In interpreting the problems which present themselves, it is the practice of the Department to consider them from the viewpoint of the operator as far as possible. This method of procedure has, it is believed, resulted in the fullest cooperation of all concerned, and while there is still room for improvement, it is an undoubted fact that the condition of the petroleum industry in California, taken as a whole, is at the present time highly satisfactory, both from the standpoint of production, and operating methods.

Respectfully submitted.

Fletcher Hamilton,
State Mineralogist.

To Fletcher Hamilton,
State Mineralogist.

Sir: I have the honor to present herewith my Second Annual Report, covering the operations of the Department of Petroleum and Gas of the State Mining Bureau, as required by law.

The harmonious conditions under which this work has been carried on since its inauguration have continued to exist during the past year, and it is with pleasure that I hereby acknowledge the assistance due to your efficient and broadguaged supervision in this matter.

Respectfully submitted.

R. P. McLaughlin,
State Oil and Gas Supervisor.

CHAPTER I.

By R. P. McLAUGHLIN, State Oil and Gas Supervisor.

The work of the Department of Petroleum and Gas of the State Mining Bureau during the second year of its operation shows considerable advance over previous accomplishments.

The legislation authorizing the establishment of the department followed a general demand, caused by oil field operations which were so haphazard and inefficient that they seriously interfered with the profits of persons engaged in the production of oil and also threatened to destroy or waste the oil resources upon which the varied industries of the people of California are dependent. The entrance of the United States into the war makes the saving of oil extremely important at the present time.

The value of an oil property depends almost entirely upon its underground condition. This condition, being invisible, can only be determined by careful scientific study. Surface equipment, while necessary for conducting operations, is of minor importance. Managers of oil properties have, during maintenance or appraisal, frequently devoted great pains to determining details relative to mechanical efficiency and value of operating plants. General efficiency and maximum profits are not obtained by centering attention on such details as relative cost of production with various kinds of pumps or sources of power while investigation of the underground condition of the wells is ignored or incompletely pursued. Properties having excellent and expensive compressor plants for lifting water from wells, or using ingenious and elaborate devices for separating water from oil, are frequently pointed out as models of efficiency. In many such cases it will be found that systematic construction or repair of wells will entirely obviate the necessity of such plants and their attendant cost.

While passing on individual problems, the department has continuously kept in view the main underlying feature of its work, namely, the general elimination of inefficient underground operations. All wells drilled have an intimate relation to all others in the immediate vicinity and no field operations can be properly conducted unless they are in harmony with a general plan based on careful and widespread study. Such studies can only be conducted by some governmental institution authorized to collect the necessary facts from all parties and enforce recommendations.

However, a governmental institution can not be expected to furnish operators with all the details necessary for the proper operation of their properties. Such an assumption could only follow a policy of complete governmental ownership and operation of all the oil fields. This department has not assumed that such a policy is contemplated, and has therefore called the attention of operators to the necessity of their giving careful study to their own underground conditions and then relying upon the department as an adviser or arbitrator. It has, however, been necessary for us to take up and completely work out some old problems, which could have been solved by technical staffs employed by the operators. Such action on the part of the bureau has usually been taken for the educative purpose of proving that the problems could be solved successfully and profitably by merely applying twentieth century, scientific methods. The department will continue to make as many such studies and demonstrations as possible, but the main portion of its activities must, for a considerable time, be devoted to the issuance of specifications on new work and inspecting all work at the wells. Oil operators must, therefore, take steps to thoroughly inform themselves as to the underground conditions of their own properties, or directly invite governmental ownership. There is every reason to believe that operators will follow the former course when it is thoroughly understood.

The steps necessary for an operator to take, in systematically developing oil land, were outlined in the first annual report, and are reprinted on pages 12 to 47 of this report. After thus setting forth the requirements in general terms, the supervisor proceeded to directly call them to the attention of operators, both by correspondence and interviews. Obviously, the most prompt and widespread results were to be expected by first addressing the largest operators, and it is therefore interesting and encouraging to indicate the steps which have been taken by all operators producing more than a million barrels of oil annually.

Public welfare will be served during the present war-time necessity for the utmost economy of labor and materials, together with the maximum production, by a public statement showing to what extent the large operators are utilizing the latest and most approved methods. The operators producing more than a million barrels of oil per year may be classified into three groups: First, those using thoroughly organized and competent technical departments for the purpose of studying underground conditions and directing development work; second, those using technical assistants to some extent, but in an inadequate and imperfectly co-ordinated manner; third, those having no organized department to take advantage of technical information. Applying this classification, the list of operators is as follows:

Southern Pacific Company (formerly operating in the oil fields as the Kern Trading and Oil Company). This company is the pioneer in systematic or scientific oil field work in California, having used such methods from the time of its first operations nearly ten years ago. The public, and particularly the oil producers, are unquestionably indebted to the company for the introduction and widespread demonstration of scientific methods of oil land development. The consulting geologist of the company, Mr. E. T. Dumble, has kindly furnished the following statement of the work of their geological department:

"The geologists have various duties as scouts, map makers, etc., but their duties which pertain to the development of oil are as follows:

"In general, the Chief Geologist's duty is to oversee and check the work of the field geologists and to advise the Superintendent of Construction, in whose hands lie the ultimate authority and responsibility under the management for drilling oil wells.

"The field geologists collect and maintain records of underground structure as developed by our own wells and those of our neighbors. From these records depths for shutting off water and for finishing wells are figured.

"As the wells are drilled the Field Geologist plots the formation each day after the wells reach critical depths. He is required to know what he is plotting—by personal inspection if necessary. He keeps in close touch with the drilling foreman and together they advise the Local Superintendent, where to land pipe, what sands to test, etc. This data is also wired to the Chief Geologist and the Superintendent of Construction if they are in another field or the head office, for confirmation.

"The Field Geologist collects such samples of drill cuttings as are deemed useful, and samples of water for analysis by the Chemist.

"He is required to be present in the derrick when pipe is cemented in the hole and to check the figures of the drilling foreman for depth, amount of water used, etc. When pipe is perforated in the hole he is also required to check measurements.

"The Field Geologist has no authority over drillers; his position is advisory only, but it is absolutely essential that he work in closest harmony with the field drilling department.

"The same is true of the Chief Geologist and his usefulness to the Superintendent of Construction.

"It is further the duty of the geologists to keep themselves informed on all new developments that have to do with underground conditions throughout the whole field and to advise the Drilling Department thereon. If new developments affect possibilities of improving old wells, these facts must be brought to the Superintendent's attention. In general, the geologists are supposed to act as an intelligence department and to keep the Drilling Department informed as far ahead of the drill as possible, while all the authority and responsibility for actual drilling and handling of wells rests in the Drilling Department.

"The field geologists handle, for the Superintendent and under his direction, the detail of reports, notices, etc., required by the State Oil and Gas Supervisor."

The **Associated** and **Amalgamated** oil companies are controlled by the Southern Pacific Company, and have assented to our suggestion that they henceforth direct their work by the same methods used by the parent company.

The **Shell Company** has been operating in California for some three years, and has from the first utilized scientific methods to good advantage. The geological work of the Shell Company of California is carried on in a most systematic manner and has demonstrated its value to the company. We are indebted to the company for the following brief outline of its department:

"The Geological Department is organized as folows: The Production Manager is ex officio head of the Geological Department.

"The Senior Geologist, who has primarily control of all geological work, devotes his time principally to investigation of new properties and exploration work in general. He also has charge of development work on all new properties, until such time as he considers them past the exploratory period.

"They are then turned over to the Development Geologist, who is directly responsible for all geological problems regarding development or production.

"The resident geologists in the various fields report to the Senior Geologist when exploration work is begun, and when a field is developed they report to the Development Geologist. They are given assistants whenever it seems necessary.

DUTIES OF THE RESIDENT GEOLOGIST.

"His most important duty is close observation of drilling wells, collecting samples and obtaining all possible information from drillers so that logs may be as correct as possible.

"Daily he checks up the production of all wells and particularly those just completed or repaired.

"As soon as data is collected on drilling wells and producing wells under observation, he phones to the city office geologist who handles development. A confirmation of this conversation is sent by private wire during the afternoon for future check.

"He takes formation samples from the drilling wells without specific instructions and oil or water samples after instructions from the city office.

"He is instructed to keep in close touch and co-operation with the Deputy Supervisor.

"Finally, he is to keep in mind that he is the most important adviser of the Field Superintendent and that he is to try to assist as much as possible in repairing wells and maintaining production.

"The daily routine is arranged by the Field Superintendent."

The **Standard Oil Company** readily adopted suggestions made by the bureau, and a technical department has been installed, with every evidence of becoming most effective.

The General Petroleum Corporation has for some three or four years directed its underground work by means of technical aid.

The Honolulu Consolidated Oil Company has been specially zealous in developing and utilizing technical and scientific methods.

Atchison, Topeka and Santa Fe Railway Company (operating in the oil fields as the Petroleum Development Company and the Chanslor Canfield Midway Oil Company). This company produces oil in three California fields. Engineering investigations have to some extent governed development work in one of the fields, and recently arrangements have been made to so conduct all work.

Union Oil Company. This company operates in all fields of the state and has recently informed this department that technical methods are to be adopted throughout the territory.

E. L. Doheny interests (American Petroleum Company, American Oilfields Co., Ltd., Pan American Petroleum Investment Company and Doheny-Pacific Petroleum Company) operate in nearly all fields of the state. So far as we are informed, after diligent inquiry, technical methods have not been systematically utilized.

Most operators annually producing less than a million barrels of oil have not applied modern methods. However, a general statement that small operators have been less progressive and efficient than their larger neighbors is certainly incorrect. There have been some notable efforts made by small concerns to scientifically direct their development work during some phase of its progress. A list of such concerns would include the

Alaska Pioneer Oil Company.
Interstate Oil Company.
Lakeview No. 2 Oil Company.
Miocene Oil Company.
Montebello Oil Company.
Nevada Petroleum Company.
Pacific States Petroleum Company.
Recovery Oil Company.
Riverside Portland Cement Company.
Santa Maria Oil Fields, Ltd.
Universal Oil Company.

GENERAL PRINCIPLES GOVERNING DAMAGE BY INFILTRATING WATER.

The desire of the bureau to stimulate interest in the methods of determining the cause of water troubles in oil fields was met by the publication of the first annual report of the State Oil and Gas Supervisor. There has been such a wide demand for the publication that the supply has been exhausted and it has therefore been deemed advisable to here reprint much information of a general nature. The opportunity to revise and amplify has been taken advantage of.

The damage done to oil fields by water arises from the fact that when water is admitted to a sand stratum, saturated with oil, it tends to displace the oil. If the entrance of water is at or near an oil well, it frequently drives the oil away from the well, which then produces only water. This process also continues along the strata and affects neighboring wells in a like manner. The entrance of the water into an oil-bearing sand is due to two primary causes: First, incomplete knowledge of geological conditions surrounding a well; and, second, faulty mechanical conditions in drilling or maintaining the well. There are a great many combinations of these two causes and a general idea of them can most easily be gained by consideration of the following sketches, which are merely a few typical cases and scarcely touch upon the various complications due to geological and mechanical conditions.

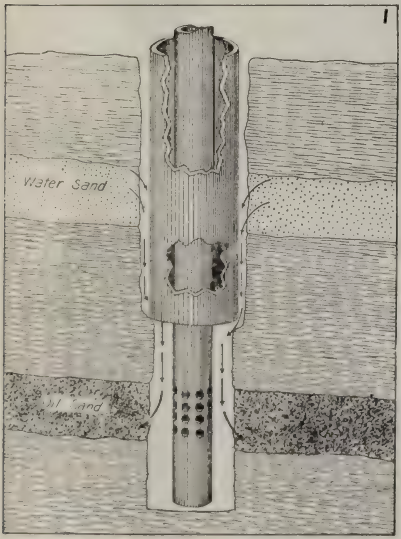


Fig. 1. Sketch showing entrance of water into oil sand due to imperfect seating of casing and to lack of cement around bottom of outer casing.

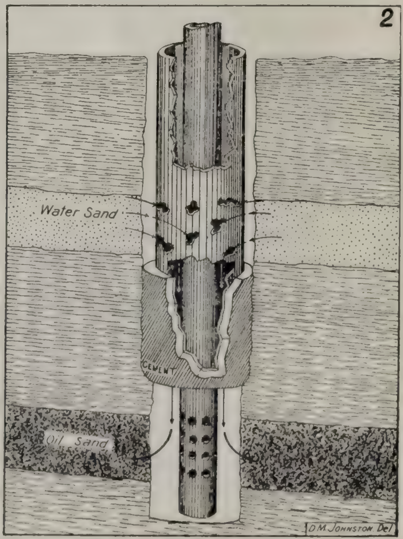


Fig. 2. Sketch showing entrance of water due to holes eaten in casing by chemical action.

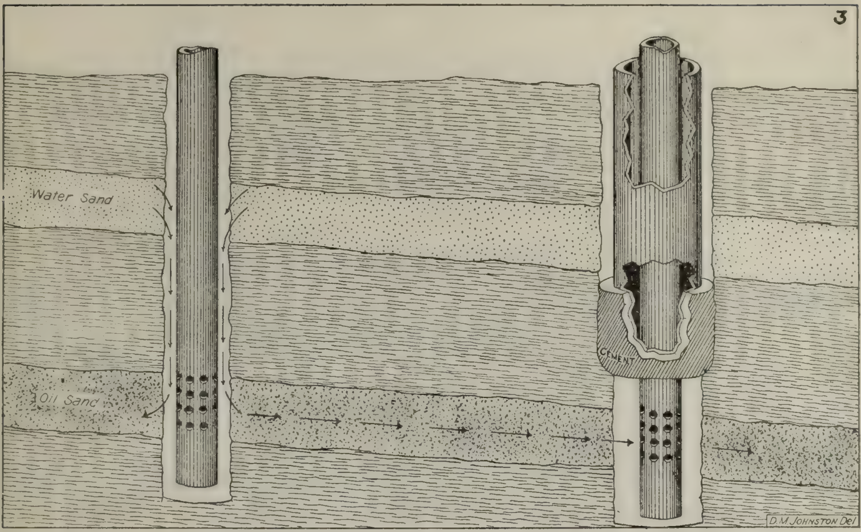


Fig. 3. Sketch showing entrance of water into oil sand and its migration to a properly drilled well. Due to use of only one string of casing in first well.

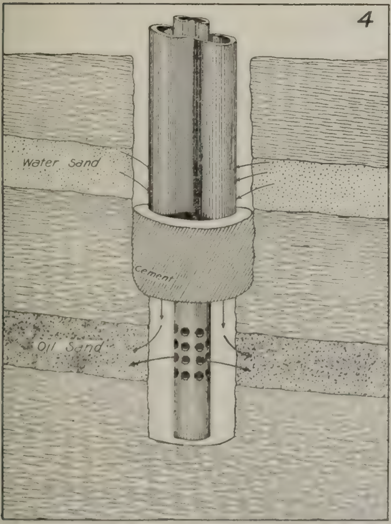


Fig. 4. Sketch showing entrance of water into oil sand due to collapse of casing.

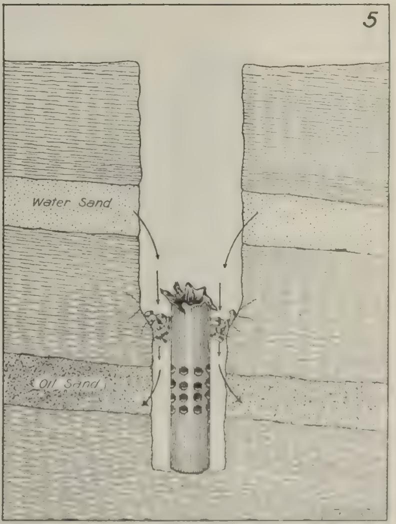


Fig. 5. Sketch showing entrance of water into oil sand due to withdrawal of casing from an abandoned well without placing a plug between oil and water sands.

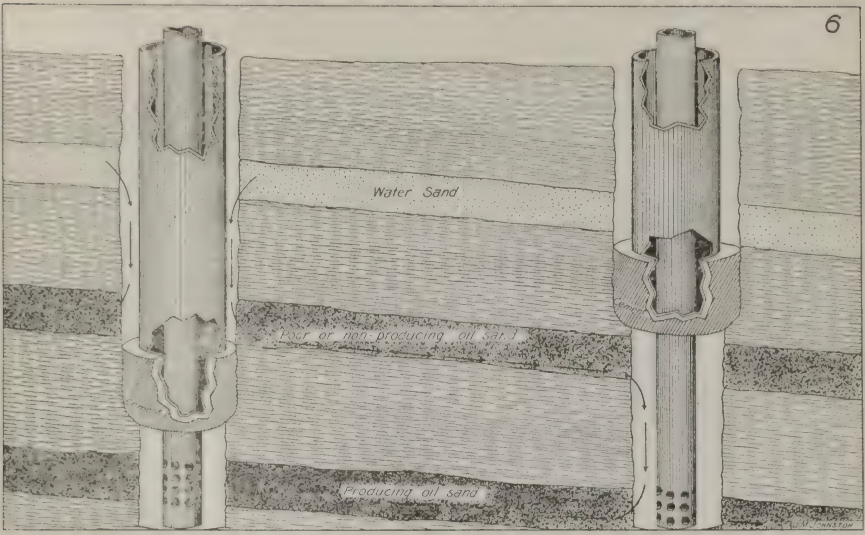


Fig. 6. Sketch showing entrance of water due to lack of uniformity of distance of shut-off below water sands when two wells penetrate the same strata. If there were only one well, either one would probably be in good condition.

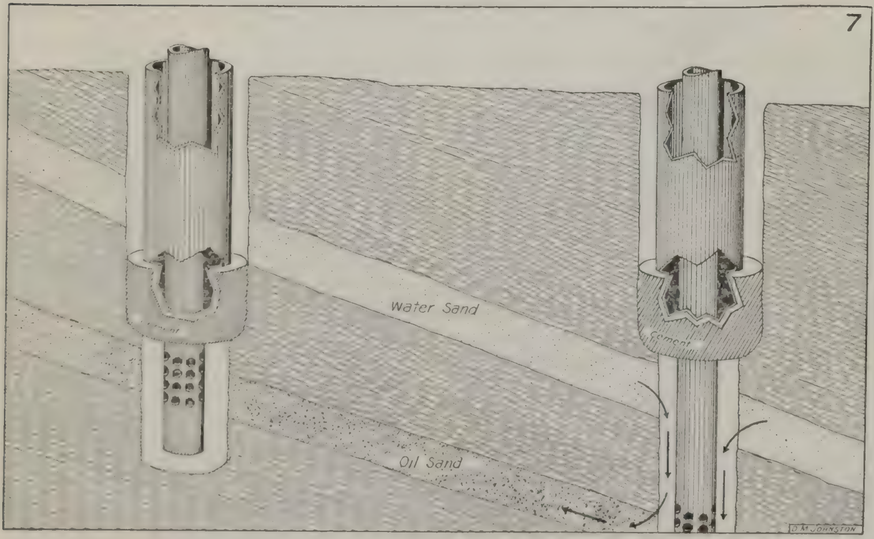


Fig. 7. Sketch showing entrance of water due to fact that shut-off was made at the same depth in two wells without considering the geological fact that strata most frequently do not lie parallel to the ground surface.

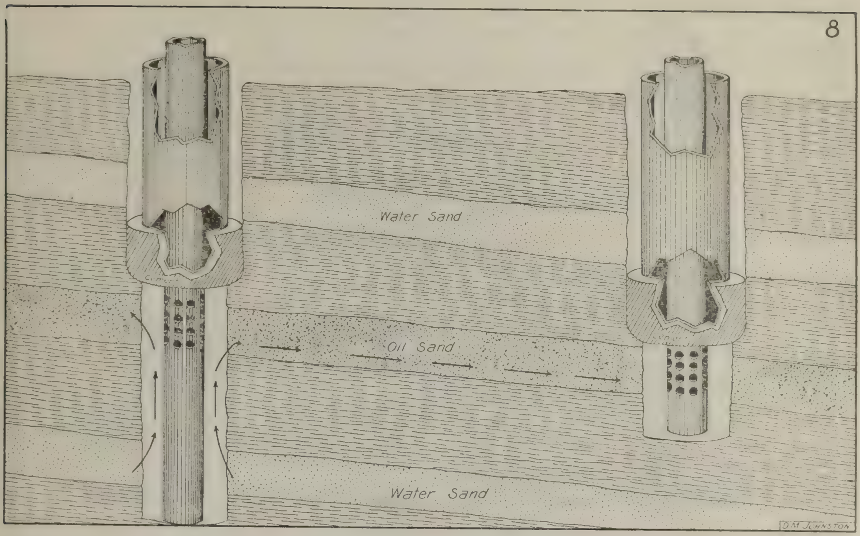


Fig. 8. Sketch showing entrance of water into a properly drilled well due to the fact that another well drilled into a water-bearing sand below the oil sand but did not plug the lower portion of the well.

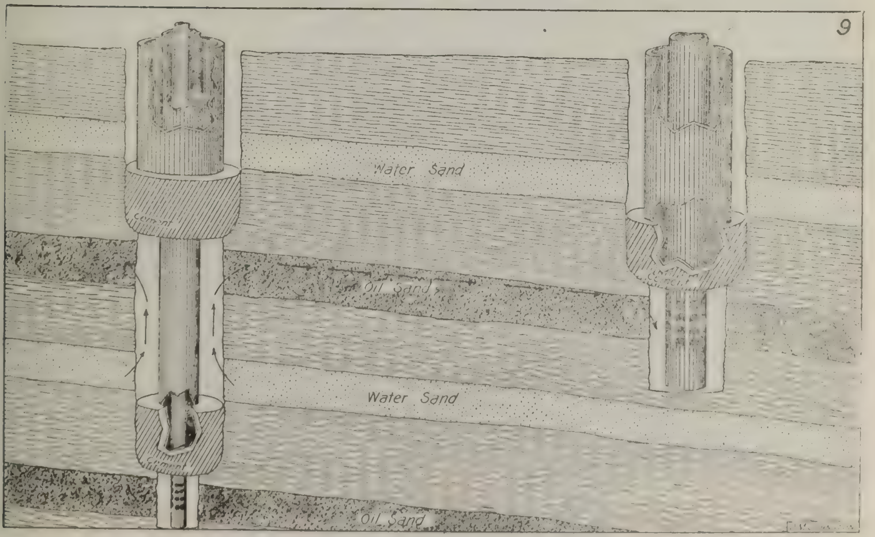


Fig. 9. Sketch showing entrance of water into a properly drilled well because a neighboring well entered a deeper oil sand without inserting an extra string of casing to protect the first sand.

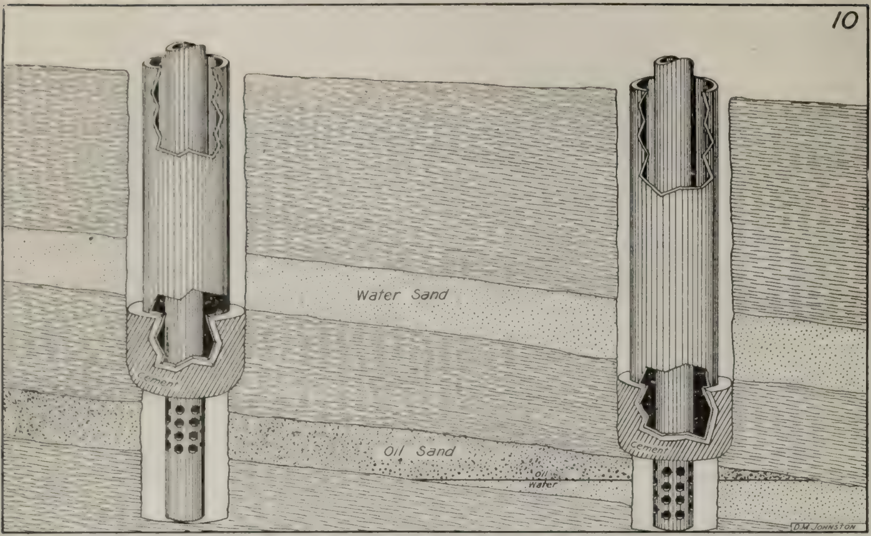


Fig. 10. Sketch showing presence of edge water due to a natural condition. Most oil sands when followed far enough down the dip are found to contain only water. As oil is removed from above, water follows it up along the stratum.

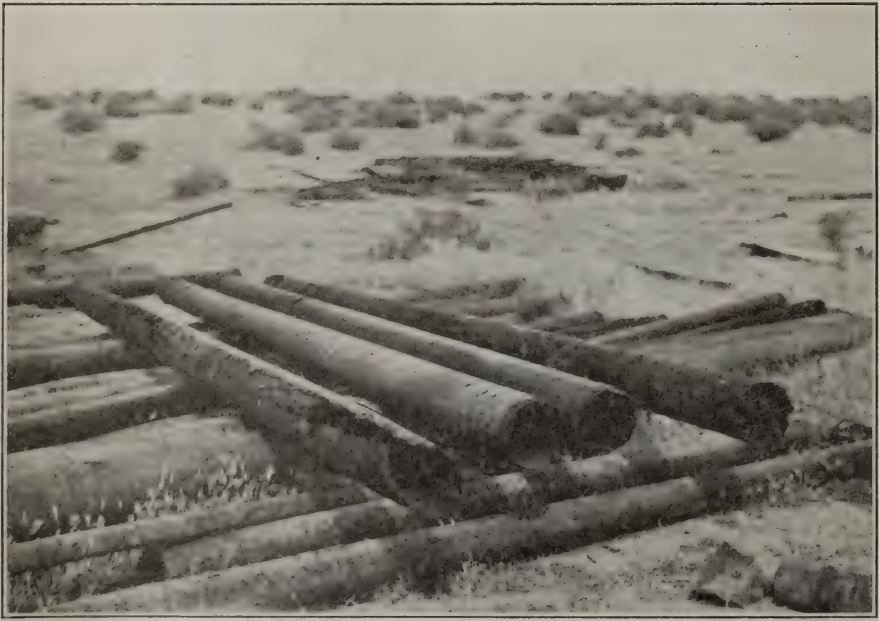


Fig. 11. View of six-inch casing, corroded between depths of 1700 ft. and 1900 ft. after about four years' use. (Photo by Paul M. Paine.)

There are various terms used in dealing with the handling of water in oil wells, and for convenience they can be best defined here in conjunction with the foregoing sketches.

Formation shut-off. The landing of casing in the walls of the well in such a manner as to prevent the passage of water without use of cement, as illustrated in Fig. 1.

Water string. The casing placed in the well primarily for the purpose of preventing water from migrating from its original position to other strata, as illustrated by the casing of larger diameter in Fig. 2.

"Top water." The water found in strata lying above the productive oil formation penetrated by a certain well, as illustrated in Figs. 1 to 7, inclusive. The term is indefinite and should be avoided by using a statement specifically mentioning depth at which the water occurs.

"Bottom water." The water found in strata lying below the productive oil formation penetrated by a certain well, as illustrated in Fig. 8. The term is indefinite and should be avoided as mentioned in the foregoing paragraph.

Intermediate water. The water found in strata between productive oil formations penetrated by a certain well, as illustrated in Fig. 9.

Edge water. The water found in a sand which also contains oil at a higher elevation or, in other words, farther up the dip. Illustrated in Fig. 10.

The administration of the law is based upon the underlying fact that damage from water, as shown in the preceding sketches, is caused by many complications and combinations of physical conditions, and therefore only can be prevented or remedied by first determining, as far as possible, what those conditions are at any particular locality. No definite rule or set of rules could be framed to cover all cases. Like all other engineering problems, this is a subject demanding a tedious collection and comparison of all pertinent facts, and therefore the deputies appointed by the supervisor are, as is required by law, engineers experienced in the drilling and operating of oil wells.

The law provides various means for compelling observance of rulings made by the supervisor, but the co-operation of oil operators has made recourse to these practically unnecessary and they therefore require but little mention here, and it is my assumption that such a condition will prevail in the future. The department aims to serve the property owners and the public as an advisor, rather than a prosecutor.

The information required to be furnished by operators, and necessary to solve existing problems, is of two classes. The first is a complete record or log of each well, giving in detail each and every step taken in its construction and repair, as well as the location and thickness of all strata penetrated so far as can be determined. The second class of information consists of a record continually brought down to date and showing the amounts of oil and of water produced by each well.

PROPER METHOD OF KEEPING OIL WELL LOGS.

Several millions of dollars are spent each year in drilling oil wells in California. In most lines of business an accurate inventory would show exactly what had been obtained in return for the outlay. Many oil operators, however, spend their development funds and have little or nothing in the way of records to show them whether or not the work has been done properly or economically. To remedy such a condition the State Mining Bureau calls attention to proper methods of recording drilling operations, and furnishes complete printed forms for the final summarizing of the logs. It is to the interest of all operators to see that their records are so kept that all the information called for on the bureau's blanks can be supplied.

The first step in keeping proper logs is to see that the operations of the drilling crew are completely written down each and every tour or shift. There are several blank forms in common use which provide a convenient means of making these daily records. The State Mining Bureau does not furnish these forms, but many printers are able to promptly supply the want. One of the handiest methods of keeping these daily drilling reports is to have them bound in book form, one page for each drilling tour. A carbon copy of each page should be made, promptly removed from the book and filed in a safe place, because the original book is subject to loss or easily becomes soiled and illegible. The daily drilling reports show the depth of the well at the beginning and also at the end of the tour, what sort of work the crew was engaged in, the size, weight and amount of casing put in or taken out. It also records the depths at which there were changes in formation, describes or names the formations, and states what evidence there was to indicate the presence of oil, gas or water in the well. Some operators make the carbon copy of the daily report serve as a time card in computing the pay of the crew.

The work of the State Mining Bureau in protecting the oil fields against infiltrating water depends upon full and complete logs of wells, and the law requires that they be furnished to the bureau. Where poor records have been encountered it is usually found that the operator had not kept daily reports.

The blank forms used in recording well logs are as follows:

Form 100.

Fill this blank in with typewriter. Write on one side of paper only

CALIFORNIA STATE MINING BUREAU

FERRY BUILDING, SAN FRANCISCO

LOG OF OIL OR GAS WELL

FIELD -- COMPANY --

Township-------------- Range------------ Section------------ Elevation---------------- Number of Well--------

In compliance with the provisions of Chapter 718, Statutes 1915, the information given herewith is a complete and correct record of the present condition of the well and all work done thereon, so far as can be determined from all available records.

Signed--

Date--

Title--

(President, Secretary or Agent)

The summary on this page is for the ORIGINAL condition of the well

OIL SANDS

1st sand from------------------to------------------

2d sand from------------------to------------------

3d sand from------------------to------------------

4th sand from------------------to------------------

5th sand from------------------to------------------

6th sand from------------------to------------------

IMPORTANT WATER SANDS

1st sand from------------------to------------------

2d sand from------------------to------------------

3d sand from------------------to------------------

4th sand from------------------to------------------

CASING RECORD

Size of Casing	Where Landed	Where Cut	Weight Per Foot	Threads Per Inch	Kind of Shoe	Make of Casing	Cemented		
							Yes	No	Number Sacks

CEMENTING OR OTHER SHUT-OFF RECORD

Casing. Size	Sacks	Time Set	Method	Test and Result (Give water level and bailing results)

PLUGS AND ADAPTERS

Heaving Plug—Material------------------------------------ Length-------------------- Where set----------

Adapters —Material------------------------------------ Size------------------------------------

TOOLS

Rotary Tools were used from------------------------------ft. to--------------ft.--------------------------

Cable Tools were used from------------------------------ft. to--------------ft.--------------------------

PERFORATIONS

State clearly whether a machine was used or casing was drilled in shop

From	To	Size of Holes	Number of Rows	Holes Per Foot	Machine—Shop
ft	ft				
ft	ft				
ft.	ft				
ft	ft				
ft	ft				

Thirty days after completion well produced------------barrels of oil per day.

The gravity of oil was----------degrees Baumé. Water in oil amounted to--------------per cent.

NAMES OF DRILLERS	NAMES OF TOOL DRESSERS
--	--
--	--
--	--

Date drilling started ----------------------------------

Date well was completed----------------------------------

FORMATIONS PENETRATED BY WELL

DEPTH TO		Thickness	Name of Formation
Top of Formation	Bottom of Formation		

Form 101. 20821—12-21-15—10M

CALIFORNIA STATE MINING BUREAU

LOG OF OIL OR GAS WELL—Continued

FIELD-- COMPANY--

Township-------------------------*Range*-------------------*Section*------------------*Number of well*-------

FORMATIONS PENETRATED BY WELL

DEPTH TO		Thickness	Name of Formation
Top of Formation	Bottom of Formation		

Form 102 8-10-15 10,000 18678

CALIFORNIA STATE MINING BUREAU

LOG OF OIL OR GAS WELL

FIELD-- COMPANY--

Township-------------------------*Range*-------------------*Section*------------------*Number of well*-------

In compliance with the provisions of Chapter 718, Statutes 1915, the information given herewith is a complete and correct record of all work done on the well since the previous record, dated------------------------------, was filed.

Signed--
(President, Secretary or Agent)

Date-- Title--

Form 103. 20822—12-21-15—10M

CALIFORNIA STATE MINING BUREAU

HISTORY OF OIL OR GAS WELL

FIELD-- COMPANY--

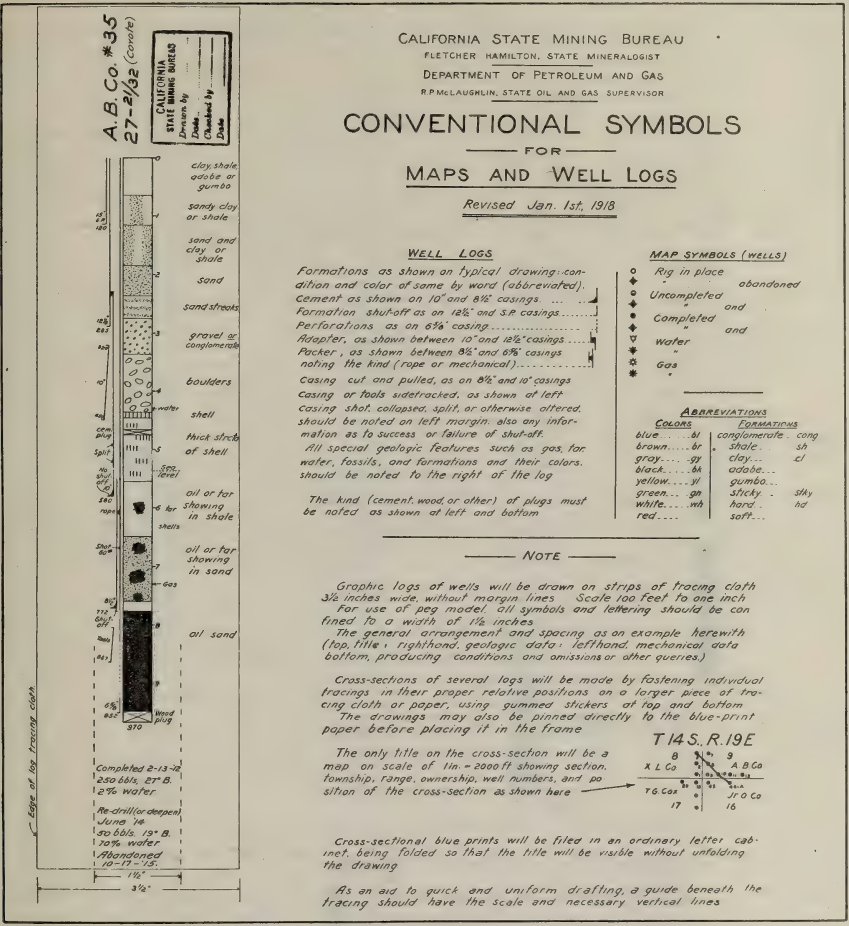
Township-------------------------*Range*-------------------*Section*------------------*Number of well*-------

Signed--
(President, Secretary or Agent)

Date-- Title--

It is of the greatest importance to have a complete history of the well. Please state in detail the dates of redrilling, together with the reasons for the work and its results. If there were any changes made in the casing, state fully, and if any casing was "side tracked" or left in the well give its size and location. If the well has been dynamited give date, size, position, and number of shots. If plugs or bridges were put in to test for water state kind of material used, position, and results of pumping or bailing.

The best method of using the written logs of wells is by making from them a drawing showing all the information. Fig. 12 shows the conventional symbols and details adopted by this bureau.



CALIFORNIA STATE MINING BUREAU
FLETCHER HAMILTON, STATE MINERALOGIST
DEPARTMENT OF PETROLEUM AND GAS
R. P. McLAUGHLIN, STATE OIL AND GAS SUPERVISOR

CONVENTIONAL SYMBOLS
FOR
MAPS AND WELL LOGS

Revised Jan. 1st, 1918

WELL LOGS

Formations as shown on typical drawing: condition and color of same by word (abbreviated).
Cement as shown on 10" and 8½" casings.
Formation shut-off as on 12½" and S.P. casings.
Perforations as on 6⅝" casing.
Adapter, as shown between 10" and 12½" casings.
Packer, as shown between 8½" and 6⅝" casings noting the kind (rope or mechanical).
Casing cut and pulled, as on 8½" and 10" casings
Casing or tools sidetracked, as shown at left
Casing shot, collapsed, split, or otherwise altered, should be noted on left margin: also any information as to success or failure of shut-off.
All special geologic features such as gas, tar, water, fossils, and formations and their colors, should be noted to the right of the log

The kind (cement, wood, or other) of plugs must be noted as shown at left and bottom

MAP SYMBOLS (WELLS)

○ Rig in place
◆ " abandoned
◎ Uncompleted
◆ " and
● Completed
◆ " and
▽ Water
✸ "
✲ Gas
✸ "

ABBREVIATIONS

COLORS		FORMATIONS	
blue	bl	conglomerate	cong
brown	br	shale	sh
gray	gy	clay	cl
black	bk	adobe	
yellow	yl	gumbo	
green	gn	sticky	stky
white	wh	hard	hd
red		soft	

NOTE

Graphic logs of wells will be drawn on strips of tracing cloth 3½ inches wide, without margin lines. Scale 100 feet to one inch.

For use of peg model, all symbols and lettering should be confined to a width of 1½ inches.

The general arrangement and spacing as on example herewith (top, title; righthand, geologic data; lefthand, mechanical data; bottom, producing conditions and omissions or other queries.)

Cross-sections of several logs will be made by fastening individual tracings in their proper relative positions on a larger piece of tracing cloth or paper, using gummed stickers at top and bottom.

The drawings may also be pinned directly to the blue-print paper before placing it in the frame.

The only title on the cross-section will be a map on scale of 1 in. = 2000 ft showing section, township, range, ownership, well numbers, and position of the cross-section as shown here

Cross-sectional blue prints will be filed in an ordinary letter cabinet, being folded so that the title will be visible without unfolding the drawing.

As an aid to quick and uniform drafting, a guide beneath the tracing should have the scale and necessary vertical lines.

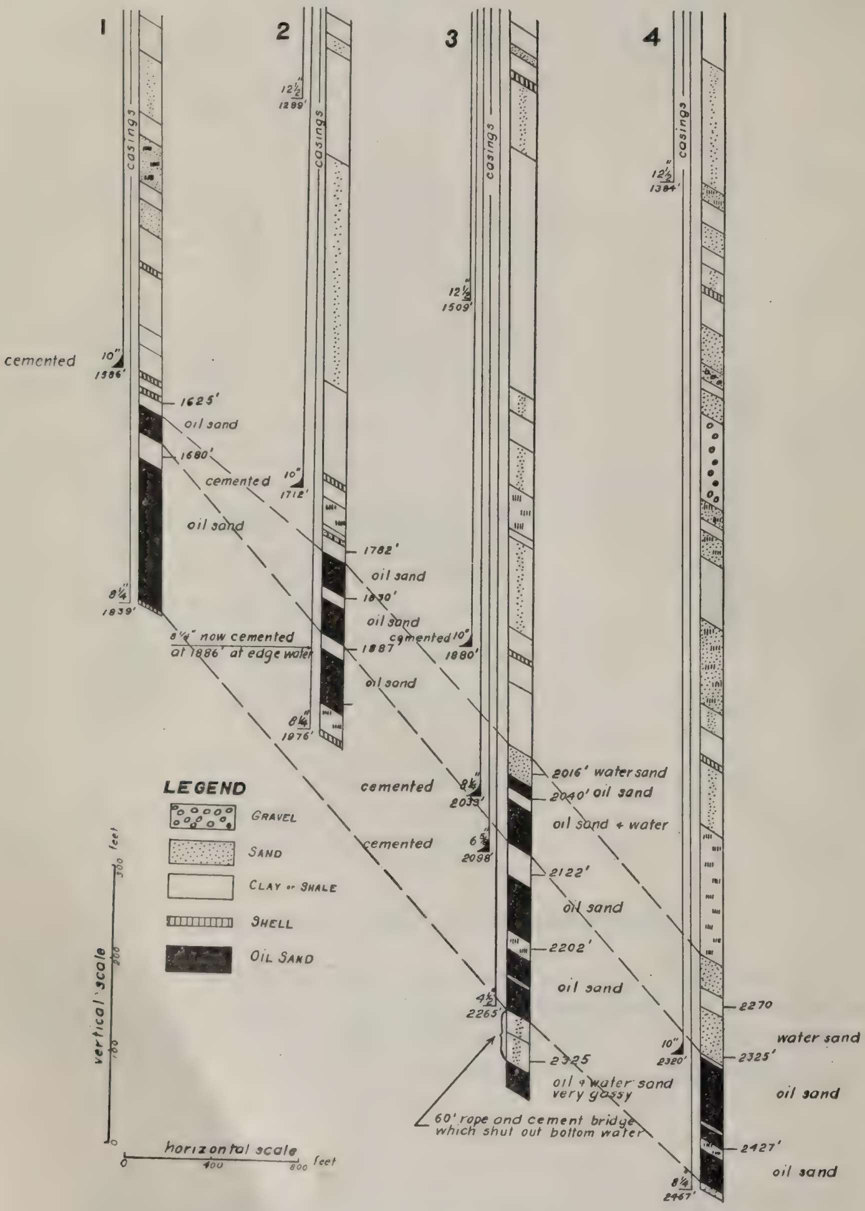
FIG. 12.

CROSS SECTIONS AND THEIR USE.

The various drawings of individual wells, along some approximately straight line on the ground, are grouped on a single drawing called a cross section. They must be properly located on the drawing, relative to distances apart and elevations above sea level.

The appearance of such a cross section and its value are illustrated by the following sketch (Fig. 13) of the bottom of four wells in the Coalinga field:

Figure 13 – CROSS-SECTION *showing underground relation of four oil wells in the* COALINGA FIELD.



The wells were drilled in order as numbered. The strata are not bent or deformed in this particular locality. In each well the 10-in. casing was intended to shut off the water occurring above the oil sands, and in well No. 3 it was landed at a depth of 1880 ft., in conformity with successful results at No. 1 and No. 2. However, the sand between 1980 and 2016 ft. was found to contain some oil and considerable water, hence it was necessary to use more casing to shut off this water. Since some experimenting was necessary, two strings, the 8¼-in. at 2033 ft. and the 6⅝-in. at 2098 ft., were used. Had all conditions been known beforehand, only one string would have been necessary, but when the 8¼-in. casing was landed and the well drilled deeper, more water was encountered and the 6⅝-in. casing had to be used. The final oil string of casing, 4½-in. in diameter, was carried to 2351 ft. and upon testing the well was found to produce mostly water, so the bottom was plugged (using waste, rope, iron lathe-cuttings and cement) up to 2265 ft. and the well again tested, when it was found to be free from water.

Since well No. 3 was one of the first wells in this locality to encounter water in the oil sands, where oil was expected, careful work was necessary on the next well drilled, to check the operations. This was done on the neighboring wells, not shown on the drawing, and, since similar results were found when well No. 4 was drilled, the top sands were shut off with the 10-in. casing at 2320 ft. The well was drilled to 2467 ft. only, so as not to encounter the sand which contained water in well No. 3 between the 2325- and 2351-ft. levels.

After completion, all these wells produced clean oil for about a year and then No. 2 began to show a little water, and about three months later showed about 80 per cent. There were three possible sources of the water: From other wells through the oil sand, or from above the oil sand, or from the bottom sands penetrated. The drawing shows that the possibility of bottom water was slight. The possibility of water from above was tested by removing the 8½-in. ''oil string,'' putting a ''bridge'' or plug in the open hole between the bottom of the 10-in. ''water string'' and the top of the oil sand. After bailing the well dry above the plug no water came in, proving that the ''water string'' was not leaking at any point and was effectively excluding upper water. Therefore, the water in No. 2 was probably coming through the oil sand itself, and as the same sand showed both oil and water between 1980 ft. and 2095 ft. in No. 3, it was concluded that the water was rising along the dip of that sand as the oil was removed. Such a movement is called the encroachment of ''edge water.'' The 8¼-in. casing was again put in and cemented at 1886 ft. in the shale presumed to correspond to that found at 2091 to 2122 ft. in well No. 3, and 2318 to 2325 ft. in well No. 4. After pumping the well for about ten days, the oil was found to contain less than 1 per cent water, proving that water had been coming through the upper sands between 1782 and 1870 ft. After about four years the water has commenced to show in well No. 1. This movement naturally follows the removal of oil and can not be stopped, but the particular sand affected can be kept separated from other productive sands.

MONTHLY PRODUCTION REPORTS.

Any person giving the slightest consideration to the matter will readily see that it is necessary to keep continuous records of the production of oil wells, showing the amounts of both oil and water coming from them. Aside from the necessity of such records in tracing the origin and course of water troubles in a group of wells, such records are of the utmost value to the owner of the wells, as otherwise he has no means of determining whether or not various wells are paying for their upkeep and operation.

A statement that many oil companies do not really know the actual financial results of their field operations might seem to be an exaggeration, but such is actually the case, and the first step necessary in a proper accounting system would be some form of production report, similar to that used by the bureau. The report blank used by the bureau is shown on the following page.

The monthly production report provides only for collecting the elementary information needed by any operator managing a property. It is believed that very little effort will be required to fill the blank at a properly operated property. The various terms used on the blank form are here more fully explained.

Barrels of clean oil. This figure should be as accurate as possible, but an actual measurement at each well need not be insisted upon, as the superintendent can ordinarily make a fairly close estimate.

Barrels of water. This figure should, if possible, be obtained by some sort of measuring or gauging system, but if that is impossible it may be computed from the results of a centrifuge test made on oil from the lead line. The centrifuge test is frequently quite inaccurate, owing to the small volume of the sample tested and the great variation, from time to time, in the behavior of a well.

Method of determining amount of water. When some actual measuring or gauging system is used, the letter M should be marked in the space. If a computation is made from a centrifuge test the letter C should be inserted.

Percentage of water. This figure is best determined directly from the amounts of oil and water produced (divide the number of barrels of water by the total number of barrels of fluid), but when either

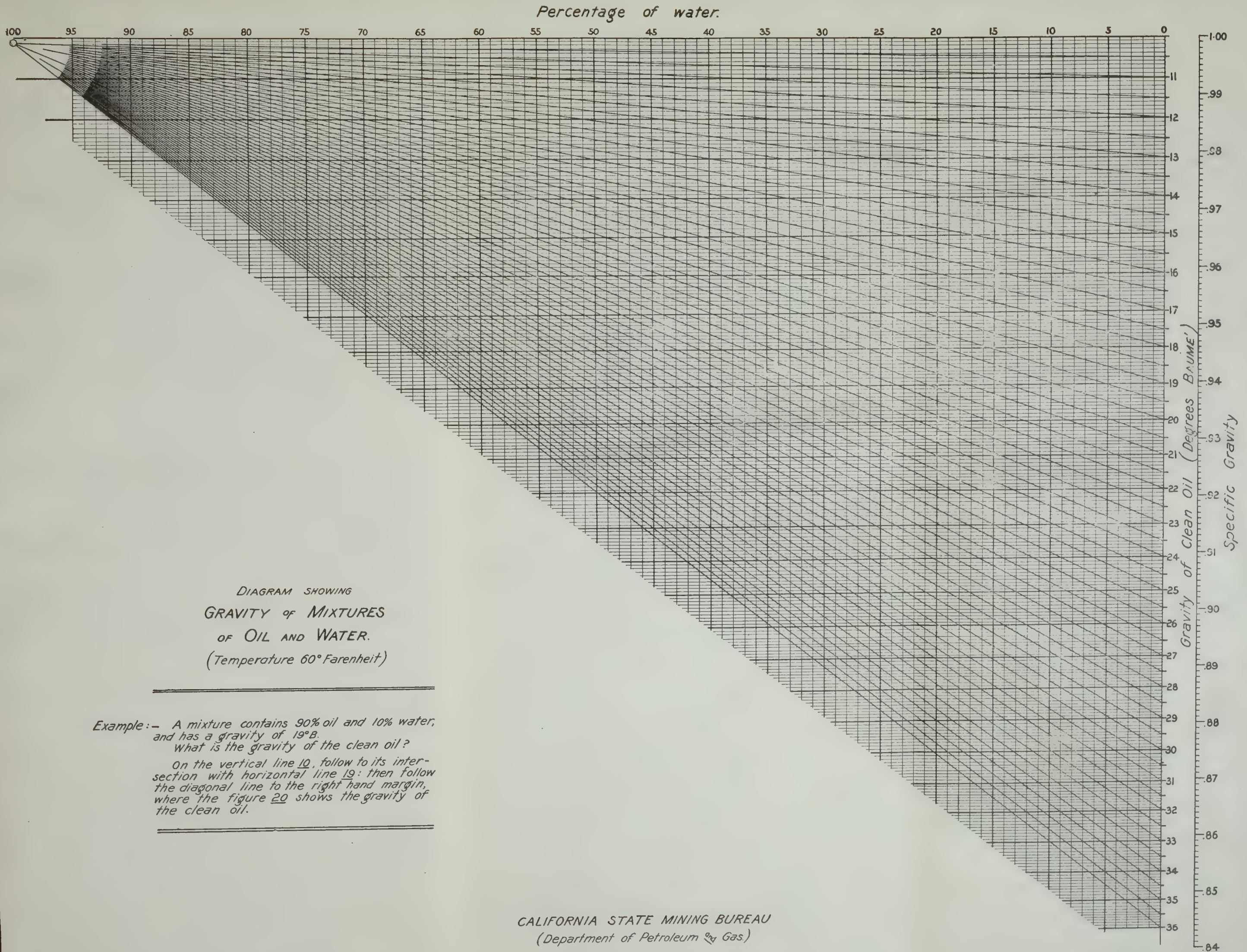


DIAGRAM SHOWING
GRAVITY OF MIXTURES
OF OIL AND WATER.
(Temperature 60° Farenheit)

Example:— A mixture contains 90% oil and 10% water, and has a gravity of 19°B. What is the gravity of the clean oil?

On the vertical line 10, follow to its intersection with horizontal line 19: then follow the diagonal line to the right hand margin, where the figure 20 shows the gravity of the clean oil.

CALIFORNIA STATE MINING BUREAU
(Department of Petroleum and Gas.)

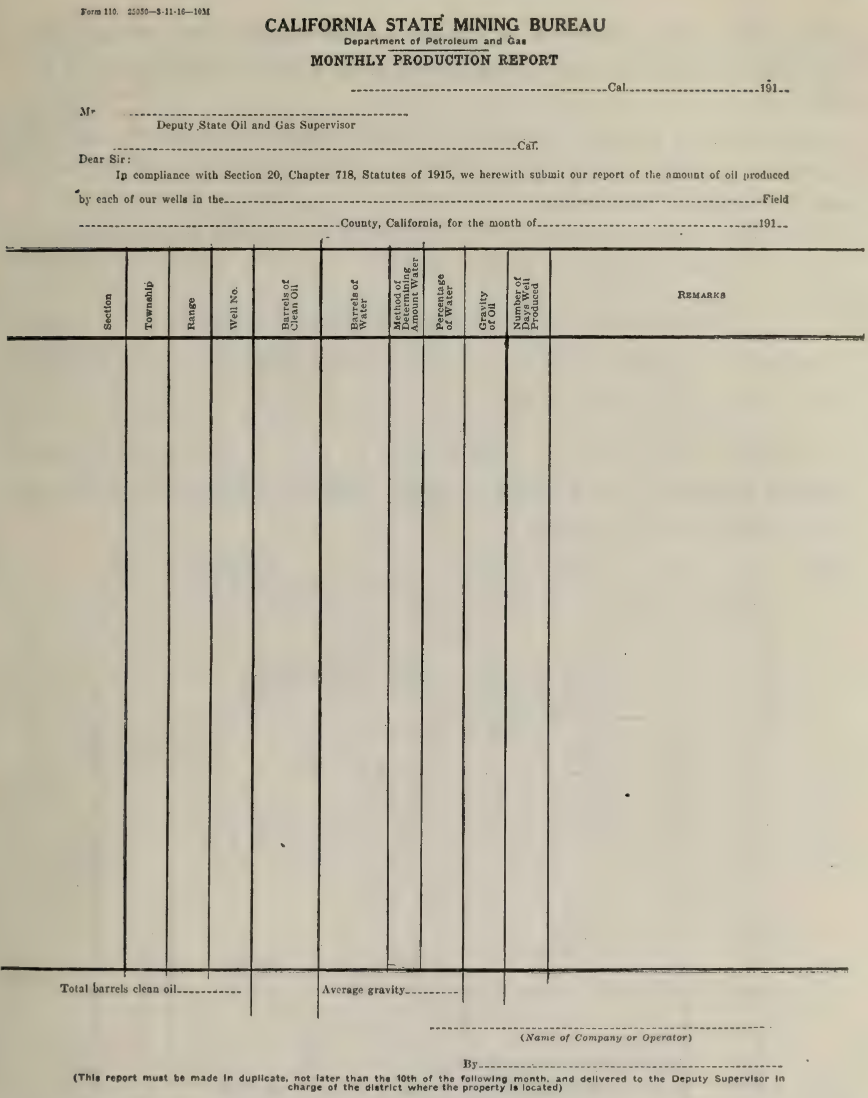
FLETCHER HAMILTON.
State Mineralogist.

R.P. McLAUGHLIN.
State Oil and Gas Supervisor.

W.E. CONDON Del.

Figure 14

36339



Form 110. 25030—3-11-16—10M

CALIFORNIA STATE MINING BUREAU
Department of Petroleum and Gas

MONTHLY PRODUCTION REPORT

..............................Cal..............................191..

Mr ....
Deputy State Oil and Gas Supervisor

..............................Cal.

Dear Sir:

In compliance with Section 20, Chapter 718, Statutes of 1915, we herewith submit our report of the amount of oil produced by each of our wells in the..............................Field

..............................County, California, for the month of..............................191..

Section	Township	Range	Well No.	Barrels of Clean Oil	Barrels of Water	Method of Determining Amount Water	Percentage of Water	Gravity of Oil	Number of Days Well Produced	Remarks

Total barrels clean oil..............

Average gravity..............

....
(*Name of Company or Operator*)

By..............................

(This report must be made in duplicate, not later than the 10th of the following month, and delivered to the Deputy Supervisor in charge of the district where the property is located)

amount is not measured, give the result of one or the average of several centrifuge tests of oil from the lead line.

Gravity of oil. This figure is in degrees Baumé as determined with a hydrometer; it varies but little and two or three tests per year should suffice. The true gravity of oil which is mixed with water can be determined by means of a test of the mixture and a study of the following diagram (Fig. 14).

Number of days well produced. This figure should as nearly as possible eliminate all the idle time. Some operators keep record of the number of hours each well pumps, which would, of course, furnish the best figure for this report.

Remarks. The report should account for every well on the property and this column can be used to state the reason for idleness of any well.

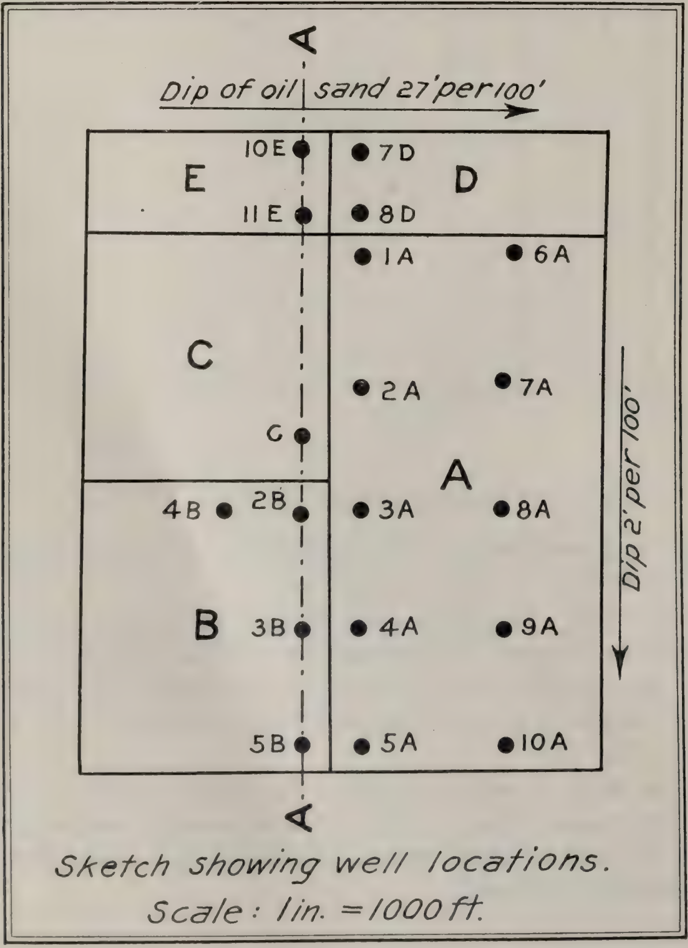
Future blank forms will carry a column for recording the depth at which the pump is working. A shallow pump depth may simply skim clean oil from a wet well.

Any officer of the bureau will be pleased to explain to any operator what is desired in filling out this report.

METHOD OF USING PRODUCTION RECORDS.

As there are many operators who do not realize the importance of production records, and seem to consider them merely as official red tape, it may be well to give an example of how they are used and what they show. The figures are from reports of wells in the Coalinga Field, situated as shown in the following map (Fig. 16), which also shows the dip of the oil-bearing sands.

Figure 16



All of the wells were drilled several years before the period covered by these figures. Some of the dates and figures have been slightly changed from those shown in the original reports, so that it is possible to show the use of records with a limited number of wells and figures. There are, of course, many factors which influence the production of wells, which do not show on a production report, such as their physical condition, and these factors must be taken into consideration when dealing with any given problem.

The figures appearing on the regular monthly production reports show the total amounts of oil and water produced and the number of days the wells pumped, as follows:

TABLE A.

Production Records Taken From the Monthly Production Reports.

Month	Well No. 1c				Well No. 2b			
	Barrels of clean oil	Barrels of water	Percentage of water	Number days well produced	Barrels of clean oil	Barrels of water	Percentage of water	Number days well produced
August	2,760	240	8.0	31	3,174	26	0.8	31
September	2,659	341	11.0	30	2,754	23	0.8	29
October	1,020	688	40.0	31	2,290	0	0.0	26
November	145	2,755	95.0	30	2,680	0	0.0	30
December	*	*	*	0	2,836	95	3.2	30
January	*	*	*	0	990	810	45.0	30
February	*	*	*	0	228	2,052	90.0	27
March	0	2,700	100.0	27	250	2,250	90.0	31
April	†	†	†	0	150	2,850	95.0	30
May	†	†	†	0	*	*	*	0
June	†	†	†	0	160	2,996	95.0	28

*Redrilling. †Shut down.

TABLE A—Continued.

Production Records Taken From the Monthly Production Reports.

Month	Well No. 3b				Well No. 4b			
	Barrels of clean oil	Barrels of water	Percentage of water	Number days well produced	Barrels of clean oil	Barrels of water	Percentage of water	Number days well produced
August	3,850	268	6.5	31	3,550	1	0.0	31
September	2,290	126	5.2	28	3,320	0	0.0	30
October	2,340	87	3.6	30	3,820	0	0.0	31
November	2,600	72	3.0	30	3,336	34	1.0	30
December	2,806	94	3.2	29	3,285	81	2.4	30
January	2,340	110	4.4	31	2,606	918	26.0	29
February	1,680	420	20.0	28	430	157	30.0	6
March	480	1,920	80.0	27	600	3,400	85.0	27
April	708	2,496	78.0	30	255	3,470	93.2	30
May	260	3,150	90.0	31	257	3,413	93.0	31
June	180	3,220	95.0	29	*	*	*	0

*Redrilling.

TABLE A—Continued.

Production Records Taken From the Monthly Production Reports.

Month	Well No. 3a				Well No. 2a			
	Barrels of clean oil	Barrels of water	Percentage of water	Number days well produced	Barrels of clean oil	Barrels of water	Percentage of water	Number days well produced
August	3,360	34	1.0	31	1,600	0	0.0	30
September	3,270	33	1.0	29	1,530	0	0.0	30
October	3,484	16	0.5	30	1,687	17	1.0	31
November	3,075	25	0.8	31	1,389	11	0.8	30
December	2,955	45	1.5	30	1,360	10	0.7	30
January	3,458	42	1.2	28	1,096	4	0.4	28
February	2,310	990	30.0	24	988	12	1.2	28
March	760	3,040	80.0	30	1,452	18	1.3	31
April	*	*	*	0	1,503	167	10.0	29
May	*	*	*	0	375	695	65.0	26
June	465	2,365	85.0	20	330	770	70.0	27

*Redrilling. †Shut down.

The figures when reduced to a common basis of daily production of oil are as follows:

TABLE B.

Average Daily Production of Oil and Water, in Barrels, for Each Producing Day During the Month.

Month	Well No. 1c			Well No. 2b			Well No. 3b		
	Oil	Water	Total fluid	Oil	Water	Total fluid	Oil	Water	Total fluid
August	89.0	7.7	96.7	102.0	0.9	102.9	124.2	0.0	124.2
September	80.8	11.3	92.1	95.0	0.8	95.8	81.8	4.5	86.3
October	32.9	21.9	54.8	82.0	0.0	82.0	70.8	2.9	73.7
November	4.8	90.2	95.0	89.3	0.0	89.3	80.9	2.6	83.5
December	*	*	0.0	94.5	3.0	97.5	96.7	3.2	99.9
January	*	*	0.0	33.0	27.0	60.0	75.5	3.6	79.1
February	*	*	0.0	8.4	76.0	84.4	60.0	15.0	75.0
March	*	100.0	100.0	8.1	72.6	80.7	17.8	71.0	88.8
April	†	†	0.0	5.0	93.0	98.0	23.6	83.2	106.8
May	†	†	0.0	*	*	0.0	8.4	104.0	112.4
June	†	†	0.0	5.7	107.0	112.7	6.2	111.0	117.2

*Redrilling. †Shut down.

TABLE B—Continued.

Average Daily Production of Oil and Water, in Barrels, for Each Producing Day During the Month.

Month	Well No. 4b			Well No. 3a			Well No. 2a		
	Oil	Water	Total fluid	Oil	Water	Total fluid	Oil	Water	Total fluid
August	114.5	0.0	114.5	108.3	1.0	109.3	53.3	0.0	53.3
September	110.6	0.0	110.6	113.0	1.0	114.0	51.0	0.0	51.0
October	123.0	0.0	123.0	116.1	0.5	116.6	54.4	0.5	54.9
November	111.2	1.1	112.3	99.2	1.0	100.2	46.3	0.3	46.6
December	109.6	2.6	112.2	98.5	1.5	100.0	45.3	0.3	45.6
January	90.0	31.6	121.6	123.5	1.5	125.0	39.1	0.1	39.2
February	71.7	26.1	97.8	96.2	41.2	137.4	35.3	0.4	35.7
March	29.6	103.0	132.6	25.3	101.3	126.6	47.0	0.6	47.6
April	8.0	115.0	123.0	*	*	0.0	51.8	5.7	57.5
May	8.0	110.0	118.0	*	*	0.0	14.4	26.7	41.1
June	*	*	0.0	23.2	131.0	154.2	12.2	28.1	40.3

*Redrilling.

A careful study of the above figures would reveal many striking features, but in order to most clearly bring out their meaning, diagrams are necessary. The diagrams here presented (Figs. 17 and 18) are almost self-explanatory and show that well 1 C was the first in the group to produce water, which quickly increased in amount, accompanied by an equally rapid decrease in the amount of oil. It will be noted that the other wells in the group later followed a similar course. This indicates that well 1 C is the source of the water trouble.

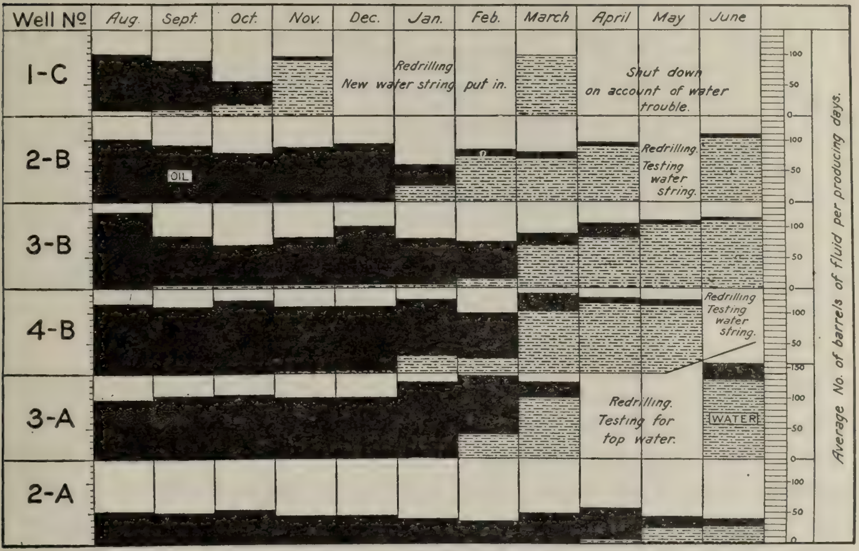


Figure 17—Diagram showing amounts of oil and water produced by certain wells.

Diagrams based only on the water percentage, such as Fig. 18, can be more easily made and sometimes are sufficient to point out the origin of trouble. However, such a diagram might be misleading, for the reason that a well reporting high percentage of water, but making only a small amount of oil, would be given equal prominence on the diagram with a more productive well. It will be readily seen that figures of percentage mean but little unless accompanied by another basic figure which shows the true volume of water. The percentage of water in the wells under consideration shows as follows in a diagram:

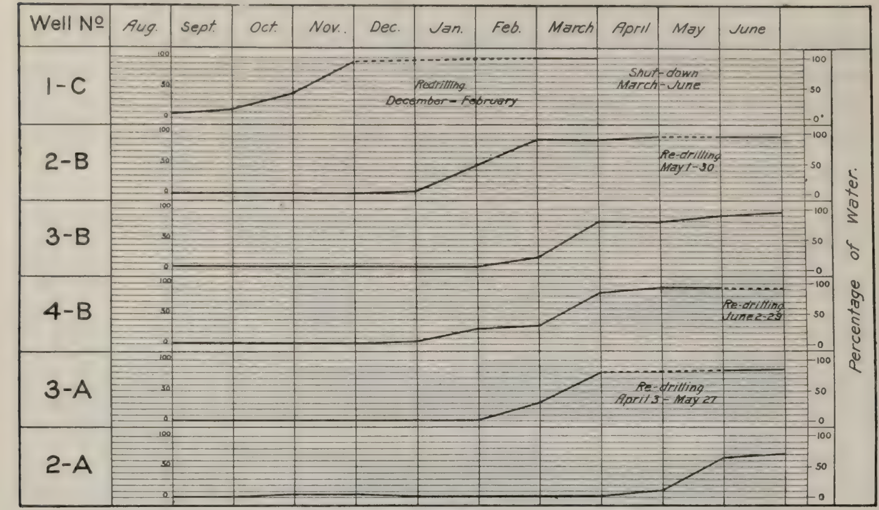


Figure 18 – Diagram showing percentages of water produced by certain wells.

FLUID LEVEL IN WELLS.

The usefulness of recording and comparing the levels to which fluid rises in wells at various times is excellently shown by some of these same wells. The following drawing (Fig. 19) is a cross section or profile through some of the wells. The dotted line shows the levels at which the fluid stood in the various wells before water trouble developed, while the solid line shows the levels about a year later, when the water trouble was serious. It will be noted that the high fluid level in well 1 C points to it as being the source of the water trouble. This is the same conclusion afforded by the figures on production.

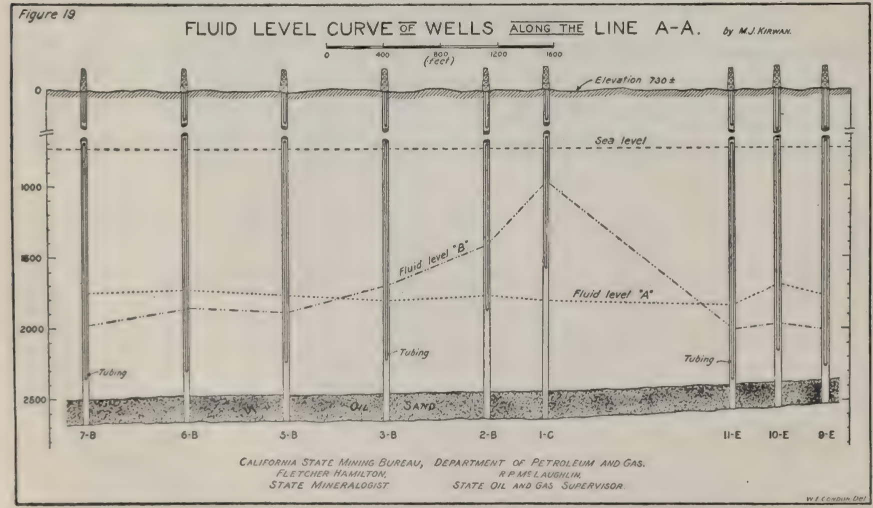


Figure 19
FLUID LEVEL CURVE OF WELLS ALONG THE LINE A-A.
by M.J. Kirwan.
0
400
800
1200
1600
(feet)
Elevation 730 ±
Sea level
0
1000
1500
2000
2500
Fluid level "B"
Fluid level "A"
Tubing
Tubing
Tubing
Oil Sand
7-B
6-B
5-B
3-B
2-B
1-C
11-E
10-E
9-E
California State Mining Bureau, Department of Petroleum and Gas.
Fletcher Hamilton, State Mineralogist.
R. P. McLaughlin, State Oil and Gas Supervisor.
W. F. Condon, Del.

NOTICE OF PROPOSED OPERATIONS.

In order to comply with the law, operators are required to notify the bureau of all proposed work. The following blanks cover all the requirements and will be furnished to all operators:

CALIFORNIA STATE MINING BUREAU

Department of Petroleum and Gas

Notice of Intention to Drill New Well

This notice must be given before drilling begins

------------------------Cal.----------------191--

Mr.--

Deputy State Oil and Gas Supervisor

--Cal.

Dear Sir:

In compliance with Section 17, Chapter 718, Statutes of 1915, notice is hereby given that it is our intention to commence the work of drilling well number------Section----- T.----- R.-----. -----------------B. & M., -------------------------------------- Oil Field,--- County

The well is----------feet N. or S., and----------feet E. or W. from------------------------------------

(Give location in distance from section corners or other corners of legal subdivision)

The elevation of the derrick floor above sea level is--------------feet.

We propose to use the following strings of casing either cementing or landing them as here indicated:

Size of Casing, Inches	Weight, Lbs. Per Foot	New or Second Hand	Depth	Landed or Cemented

It is understood that if changes in this plan become necessary we are to notify you if possible before cementing or landing the casing.

We estimate that productive oil or gas sand should be encountered at a depth of about--------------feet, more or less.

Respectfully yours.

(Name of Company or Operator)

By--------------------------------------

Address notice to Deputy State Oil and Gas Supervisor in charge of district where well is located

CALIFORNIA STATE MINING BUREAU

Department of Petroleum and Gas

Notice of Test of Water Shut-off

This notice must be given at least five days before the test, and a longer time is desirable

---------------------------Cal.----------------191--

Mr.--

Deputy State Oil and Gas Supervisor

--------------------------------------Cal.

DEAR SIR:

In compliance with Section 19, Chapter 718, Statutes of 1915, notice is hereby given that it is our intention to test the shut-off of water in well number------Section--------T.----------R.---------, -------------B. & M., --Oil Field, ------------------------------------County, on the----------------day of------------------------------------191--.

landed

----------inch casing was cemented in--------------------(Formation) at-----------(Depth) on-------------------(Date) 191--.

----------sacks of cement was used.

The---method was used in placing the cement.

Fluid level will be bailed to a depth of--------feet and left undisturbed for at least 12 hours before your inspection.

The well is-----------feet deep. There {is not / is} a plug or bridge from----------feet to----------feet.

Respectfully yours,

(Name of Company or Operator)

By--

Address notice to Deputy State Oil and Gas Supervisor in charge of district where well is located

CALIFORNIA STATE MINING BUREAU

DEPARTMENT OF PETROLEUM AND GAS

Notice of Intention to Deepen, Redrill, Plug or Alter Casing in Well

This notice must be given fifteen days before work begins when possible

.... Cal.................191...

Mr...

Deputy State Oil and Gas Supervisor

....Cal.

DEAR SIR:

In compliance with Section 17, Chapter 718, Statutes of 1915, notice is hereby given that it is our intention to commence the work of deepening, redrilling, plugging or altering casing at well number..................
(Cross out unnecessary words)
Section..........T...........R..........., ...B. & M., ...Oil Field, ...County.

The present condition of the well is as follows:

The proposed work is as follows:

Respectfully yours,

....
(Name of Company or Operator)

By..

Address notice to Deputy State Oil and Gas Supervisor in charge of district where well is located

3—36639

Form 108. 19219—9-17-15—5000

California State Mining Bureau

Department of Petroleum and Gas

Notice of Intention to Abandon Well

This notice must be given at least fifteen days before work is to begin

----------------Cal.--------------191--.

Mr.------------------------------------

Deputy State Oil and Gas Supervisor

---------------------------------------Cal.

DEAR SIR:

In compliance with Section 16, Chapter 718, Statutes of 1915, notice is hereby given that it is our intention to abandon well number-------Section-------T.-------R.-------, ----------------------------------Oil Field---------------------County, commencing work on the-----------day of-------------------------191--.

The present condition of the well is as follows:

The proposed work is as follows:

Respectfully yours,

(Name of Company or Operator)

By-------------------------------------

Address notice to Deputy State Oil and Gas Supervisor in charge of district where well is located

CALIFORNIA STATE MINING BUREAU

Department of Petroleum and Gas

SUPPLEMENTARY NOTICE

........................Cal.......................191..

Mr...

Deputy State Oil and Gas Supervisor

....Cal

Dear Sir

Please be advised that our notice to you dated........................ 191.. stating our intention to..................(Drill, deepen, redrill, test abandon) well number........Section........T........R........B & M. ....Oil Field, ...County must be amended on account of changed or recently discovered conditions

The new conditions are as follows·

We now propose

Respectfully yours,

....
(Name of Company)

By..........................

NECESSITY OF GEOLOGICAL AND ENGINEERING WORK.

While discussing the importance of systematic work and its value to the oil operators themselves, entirely aside from legal requirements of this department, it may be well to explain the functions of an engineer or geologist, which seem to be understood by comparatively few oil men.

At the present time, fortunately, it is not necessary to point out the usefulness of a geologist in choosing new or prospective oil lands. Most operators of importance now realize that systematic study of earth conditions, by a specially trained man, is a better method to pursue in planning investment of money, than to merely spend it on incomplete information and then plan how to recover it. Consequently, geologists are usually employed before drilling begins. However, there are too few companies who realize the importance of continuing to properly use the services of a geologist or engineer after the land has been selected and development commenced.

The larger operators, of which there are possibly a dozen in California, will particularly benefit by considering this question. Possibly the small and comparatively inactive concerns would not be justified in the expense of attempting to individually make use of such work, but several such companies could profitably join in employing a competent engineer.

It must be clearly borne in mind that the work of this bureau covers only the prevention or repair of damage. The bureau has neither the facilities nor inclination to direct the management of private properties. It will, however, assist operators, whenever it is possible, to solve their problems.

INEFFICIENCY IN OIL FIELD OPERATIONS.

The work of the bureau is not directed to a study of operating conditions, but observation of them could not well escape notice, while the regular work was being carried on. In fact, a most excellent opportunity is afforded to compare various methods. This broad field of observation justifies the statement that there is probably no large business so inefficiently conducted as is that involved in the production of oil in California, notwithstanding the fact that mechanical operations here seem to be more advanced and improved than in any other part of the world. The annual losses, due to unsystematic work and actually paid out of pocket, amount to hundreds of thousands of dollars. Bankruptcy would speedily follow such management in any line of business not dependent upon either a most abundant natural supply of crude material or fresh infusions of capital from other sources. These two alleviating conditions can not be expected to continue indefinitely.

The producing branch of the oil business is, of course, all important, because all other branches of the business depend directly on it. It will be clearly realized, by any reasoning person, that to economically extract oil from its natural underground reservoirs requires the most complete knowledge possible on two subjects: First, the natural or geological conditions governing the creation and preservation of the reservoirs, and, second, the artificial or mechanical conditions created near the reservoir by efforts to drill wells and extract the oil. There is absolutely no other way of utilizing the necessary knowledge than by placing the sole responsibility of outlining and directing all development work in the hands of men who possess such knowledge. The solution of the problem, to use other words, requires engineering skill. Such a statement is not theoretical or visionary, and its correctness is proved by the consideration of other and similar industries, such as the mining of the important metals, in which development work is directed as an engineering problem. Further proof that twentieth century methods, using technical skill, are applicable to the oil-producing business, is furnished by the fact that several of the largest companies in California, shown on pages 9 and 10, are employing such a system.

There has been a hazy notion among oil operators of the value of the geological information, and numerous concerns have made an effort to collect it but have stopped short when it came to applying it. The bureau has frequently had most elaborate and expensive geological data presented to it in the form of records, only to find, on pursuit of an inquiry, that the so-called geological department of a company had no knowledge as to whether the so-called operating departments had followed the preliminary suggestions and, furthermore, had no knowledge of facts subsequently developed by drilling operations. The inefficiency was found to not simply end with the disclosure that the operating departments had no knowledge of the preliminary work of the geological departments, but really had no connected knowledge or records of their own drilling work.

A single example, chosen at random from numerous cases, may be used to illustrate the results of such lack of system. A well costing about $50,000 developed water trouble and had never been a satisfactory producer. The supposedly complete record of the well, as furnished to the bureau by the owners, simply showed that a string of casing had been properly cemented below the water sand and above the oil sand. The owners had no definite opinion as to the cause of the trouble, and even expressed an inclination to plug and abandon the well, charging the expense of drilling the well to profit and loss.

Further inquiry by the bureau caused a more extended search for records kept by owners, and developed the fact that several hundred feet of casing had been lost during drilling operations and was left in such a position that it might form an almost ideal channel through which the overlying water might descend to the oil-bearing formation. Notwithstanding the amount of money invested in the well, there had apparently been no steps taken to either demonstrate or disprove such a possibility. This particular well may, of course, be repaired under the direction of the bureau, but it seems almost incredible that a large company, merely seeking profit from its invested money, could have allowed such a condition to arise and exist for several years. The employment of a competent engineer, authorized to gather all the facts and see that his recommendations were carried out, would prevent such wastefulness and relieve the superintendent of unjust criticism for not attending to details, which he could not possibly carry along with those of his routine work.

METHODS OF SHUTTING OFF WATER.

The following descriptions and statements relative to methods of shutting off water are written by several members of the bureau staff, namely, R. B. Moran, M. J. Kirwan, R. D. Bush and R. P. McLaughlin.

In most of the oil fields water is found in the formations overlying the oil sands. There are a number of methods in use for excluding this water from the wells. Local conditions must be taken into account in the choice of method used in any particular case. Shallow wells are often successfully handled by landing the casing in impervious strata, but in deep drilling in California in the majority of cases hydraulic cement is used.

Formation shut-off is the term applied to a shut-off where casing is landed in a bed of shale or clay without using cement or other device to plug the space between the casing and the wall of the hole. Much depends upon the kind of casing shoe which is used. It should be a plain shoe, as distinguished from the notched Baker shoe and from the types used in rotary drilling. A shoe 14″ to 20″ in length is usually used, although in a few cases in deep work shoes from 6″ to 20″ in length have been tried. It is important not to have the largest diameter of the shoe at the bottom, so that it can be driven tightly into the formation. When a suitable shale or clay is reached where it is desired to land the water string, the hole is drilled ahead with a smaller-sized bit and the casing is driven until the shoe is tight in the formation. This will prevent the water from following down the outside of the casing and entering the well.

At the first departure from the simple formation shut-off, clay and chopped rope were put into fill and seal up the space between the shoe and the wall. A practice in vogue before the use of the cement, but now obsolete, was to make a landing on a hard lens or ''shell,'' as it is usually termed, depending on a bag of flaxseed to seal up the space around the shoe. The hole was carefully trued up and cuttings removed, then the seed bag was lowered into the hole and casing landed on it. The swelling of the seed upon taking up water was depended on to hold back the water long enough to allow the mud to settle and the formation close in enough to make a permanent job.

Tamping is a method which has been in use a number of years but which now has but few followers. A complicated expanding packer is put onto the oil string where it is desired to make a shut-off. This point, however, must also be below the next larger string of pipe. The packer is made of canvas and might be described as an inverted umbrella. Sand and pulverized shale is then run in between the casings by means of a stream of water. The outer string must be moved up and down all the time, both for the purpose of keeping the material introduced moving down to the bottom of the hole and for the purpose of tamping it tight around the shoe. As the space below fills up, the tamping string is removed joint by joint. This operation takes from three to six weeks. A few men advocating the practice claim that the casing recovered repays the labor involved. It is also evident that by this means a string of casings is saved, the last string serving as both the oil and water string. It is readily seen to be a process which would only be applicable in drilling where formations stand up sufficiently to allow the removal of casing at will. An interesting sidelight on conditions which are sometimes encountered is given by the statement that 70 cubic yards of *sand* were used in filling up a space behind a single 20″ length of 8″ pipe.

Hydraulic cement is now being generally used in California for excluding water from oil sands. What is called the ''dump bailer'' method is the simplest in use. The hole is first trued up and carefully cleared of cuttings in case the work is done at the bottom of the hole. If the hole has already been carried below the shut-off point it is necessary to put a bridge in, or, in other words, a false bottom in the hole. The casing is raised off the bottom. Thirty or forty sacks of cement, mixed to the consistency of thin gruel, are lowered to the bottom by means of the dump bailer. The casing is then filled with water to the top and a cap screwed on, then when the string is lowered to bottom, the cement is forced out behind the casing. Time is allowed for the cement to set, after which any that has been left in the hole is drilled out. If the displacements have been accurately figured this will leave only a few feet on the inside of the casing which gives little or no trouble in drilling out. One of the advantages of this method is the fact that where mud has been used in drilling, this mud can be left behind the casing. It is the usual practice in some fields to put in a few barrels of clear water in advance of the cement, so as to give it a better chance to set without being mixed too much with mud. In experienced hands this method has scored a large percentage of successful shut-offs, even in deep territory. The amount of cement used is necessarily limited and consequently the method is applicable only to cases where there are no large cavities to be filled, such as often occur in redrilling or other troubles in wells.

The pumping in of cement by pressure pumps is the method in most general use. For this purpose complete outfits are mounted on auto trucks and steam connections are made with the boiler at the well. Two pumps are generally used. The work is generally started with a pump capable of delivering a pressure of 300 to 400 lbs. and finished with one capable of 700 to 800 lbs. The cement is mixed in a portable mixing trough. Neat cement is used and it is mixed to the consistency of thin gruel.

There are a number of variations as to the details of the method. In all cases it is important to true up the bottom of the hole and remove the cuttings. The casing is raised a few feet from the bottom, while the cement is being pumped, and then it is lowered to position after the cement is in place. Some operators circulate water prior to running in the cement until the clear water comes to the surface outside the casing. Others leave as much circulated mud in the hole as possible, only pumping in a small amount of clean water in advance of the cement in order to prevent the mud mixing with the cement, the idea being to leave this mud to settle around the casing and thus prevent the movement of waters from one stratum to another.

An early method, now little used, was to pump cement through tubing, a packer being placed at the bottom of the casing to prevent the return of the cement between the tubing and the casing. An improvement on this method, now extensively used, is to pump the cement through tubing which passes through a casing head, provided with a release and fitted to the top of the water string. The tubing is lowered to within a few feet of the casing shoe, the distance depending on the amount of cement it is desired to leave in the casing. Water is pumped in to get circulation outside the casing and then the casing head release is opened and the casing pumped full of water, which prevents the cement from coming up between the tubing and the casing and forces it outside the casing, when the release is closed. After the cement is in and displaced from the tubing with water, the casing is lowered in place and all connections closed until the cement has taken its initial set, to prevent a possible return of the cement around the shoe. There are two methods of determining when the cement has been displaced from the tubing. First, to calculate the capacity of the tubing and measure the required amount of water; and second, to reduce the diameter of the lower end of the tubing with a swedge nipple. A wooden plug is then put in, after the cement and ahead of the displacing water. When the plug reaches the swedge nipple and the cement is out, the pump pressure jumps up and the circulation stops.

The majority of the operators now pump the cement directly into the casing and then displace it and force it out behind the pipe by filling it up with water. Some operators figure the contents of the casing and stop the pumps when the calculated amount of water has been pumped in. In some cases the water is measured with a meter, while others consider this too risky and measure the water in tanks, thus having the exact quantity at hand. One case came to our notice where it was discovered that the meter was not working after the cement had been pumped in. Water was then pumped in until the cement was returned to the surface outside the casing.

In another method two wooden plugs about three feet long are used. They are made to fit tightly against the casing by means of rubber belting. The plugs are introduced by means of special arrangements of gates and fittings. The first plug is started down the casing ahead of the cement to prevent the water and cement mixing. The original publication (Bulletin No. 73, p. 215) erroneously stated that "The casing is raised off the bottom high enough to allow this plug to pass clear out of the casing." The usual practice is to raise the casing about 18″ so that the upper portion of the first plug remains in the casing. Sometimes a wooden "spreader," 2″ x 4″ x 6′ to 15′ long is run in ahead of the second plug. This retains within the casing cement which has become excessively diluted and would otherwise rest at the critical position immediately around the shoe of the casing. The plugs and "spreader" are easily drilled out. The second plug is introduced after the cement is pumped in and the casing lowered so that the plugs and "spreader" will not be passed out of the casing but come to rest and thus run up the pressure of the pumps when all the cement has left the casing. In using this process it is customary to measure the water pumped in behind the second plug as a check on its progress.

The amount of cement used varies from five to thirty tons, according to local conditions. On an ordinary job, without any complications resulting from caving, ten to fifteen tons are used. Most operators use larger quantities than would be needed, for the simple purpose of plugging off water behind the shoes, because it serves to reinforce the casing by filling the space between the casing and the wall and also prevents corrosion from mineral waters. It is not uncommon to find in redrilling or abandonment of wells where large amounts of cement have been used, that the cement has followed up the casing as much as 1000 feet. In a few cases where formations showed decided tendency to collapse casing in completed wells, as much as thirty tons have been used in the hope of holding back the walls and preventing this collapse.

The shutting off of "bottom water" is a different problem, and usually a much more difficult one than presents itself in shutting off "top water." Oil sands have been drilled through and the operator often has to contend with gas, loose sand, sidetracked or slivered casing. The hole must first be cleaned out and, if any casing was left in when the oil string was pulled, it must be shattered with dynamite and plugged up above the water sand. Some operators have been successful by putting in rope, brick, etc., and tamping down thoroughly with the tools and on top of that, as a foundation, tamping down a mixture of cement and lathe cuttings put in dry in tin cartridges. These are broken up and the cement mixed with water in the hole by the tools. Others have been successful, simply dumping in neat cement with a dump bailer, up to the bottom of the lowest oil sands.

Probably the best method, and the one that has met with success under the most difficult conditions, is by pumping the cement through tubing, which enables the operator to put it under pressure and force it out into cavities and channels that would not otherwise be filled with cement. The outfit is similar to that described above for cementing a water string with the tubing and casing head, and in addition the space between the oil and water string is packed off at the top of the water string, thus preventing the cement from coming up between these two casings, and is so constructed as to allow the movement of the oil string through it if that is desired. In using this method it frequently happens that the oil sands above will absorb considerable water, and continue to do so until the cement comes up and shuts this off to some extent, causing the pump pressure to rise and forcing the cement into the formation below. Thus the oil sands become somewhat deadened and it may be some time before the former production is obtained from these sands; however, it is not believed that the cement forms a solid wall around the casing in the oil sands, which would shut out all the oil, for the reason that there is sufficient gas and movement of the cement to keep it from setting. Some operators advocate mudding up the oil sands first, in order to keep the cement out and prevent circulation, but this would, no doubt, prevent the return of the oil to a greater extent than the cement.

The most difficult problem the operators have to deal with is the case of a water sand between oil sands, where it is desired to produce from the lower oil sand and give the upper oil sand the proper protection from water. In many cases this would require two additional strings of casing, generally reducing the diameter of the hole, in some cases to an impracticable size, the original oil string being cemented above the water sand, one additional being cemented below the water sand, and one additional for the new oil string. One operator in the Coalinga field successfully solved this problem in one well with one string of casing, giving the lower sand a test, which, however, proved nonproductive. The original oil string was cemented below the water sand, enough cement being put in to go above the water sand, and cement the casing in the overlying shale. The lower oil sand was bailed dry and later that portion of the hole below and a few feet up into the water string was plugged up with cement. Then the casing opposite the upper oil sands was perforated and tests proved that these oil sands were free from water.

AMOUNT OF CEMENT NECESSARY.

The amount of cement required to fill certain spaces in an oil well should be approximately known when a job is commenced and the following table, where the space is exactly stated, can be used for such a purpose. In actual practice the exact cavity may not be known. The table is based on the fact that a sack of cement, weighing about 100 pounds, will occupy about 1.1 cubic feet after being mixed with water and allowed to set.

Lineal Fee Filled by One Sack of Portland Cement Alongside of Oil-Well Casings.

(One sack equals 1.1 cubic feet neat cement when set.)

Size of casing		Diameter of well (excess over casing diameter)					
Normal	Actual outside diameter	One inch	Two inches	Three inches	Four inches	Five inches	Six inches
	Inches.	*Feet.*	*Feet.*	*Feet.*	*Feet.*	*Feet.*	*Feet.*
4¼-inch	4.75	19.2	8.8	5.4	3.7	2.8	2.2
4½-inch	5.00	18.3	8.4	5.2	3.6	2.7	2.1
5⅝-inch	6.00	15.5	7.1	4.4	3.2	2.4	1.9
6¼-inch	6.625	14.2	6.6	4.2	2.9	2.2	1.7
6½-inch	7.00	13.5	6.3	4.0	2.8	2.1	1.7
7⅝-inch	8.00	11.9	5.6	3.5	2.5	1.9	1.5
8½-inch	8.625	11.2	5.2	3.3	2.4	1.8	1.4
9⅝-inch	10.00	9.7	4.6	2.9	2.1	1.6	1.3
10 -inch	10.75	9.0	4.3	2.8	2.0	1.5	1.2
11⅝-inch	12.00	8.1	3.9	2.5	1.8	1.4	1.1
12½-inch	13.00	7.5	3.6	2.3	1.7	1.3	1.0
13½-inch	14.00	7.0	3.4	2.2	1.6	1.2	1.0
15½-inch	16.00	6.1	3.0	1.9	1.4	1.1	0.9

MUD LADEN FLUID METHOD.

The term "mud laden fluid" herein used applies to a mixture of clay with water, the water carrying the finely divided clay in suspension in quantities varying from 5 to 25 per cent.

Mud laden fluid has been commonly used in rotary drilling and with the use of a circulator system has been mainly to ''mud-off'' formations which do not stand up well, and cave in in such a manner as to ''freeze up'' the casing. Mud laden fluid has also been successfully used in mudding off gas formations. The mud laden fluid method for shutting off water is comparatively new in California fields and has not been sufficiently demonstrated to receive the wholesale approval of this department. This mud fluid process should be tried only on wells favorable for demonstrating its success or failure, and in general on wells which are not line wells unless agreeable to the neighbors concerned.

In connection with the foregoing discussion of the practice of shutting off water by the mudding process it is evident that this method should be tried in simple cases only, such as top water, until such time as the method has been thoroughly demonstrated. In case this method is applied to wells where a water sand lies between the oil sands, the adjoining wells should be free from water so as to indicate, by their production, the success or failure of the experiment. Wells should be cemented where the mud process is tried in redrilled or old wells where the formation is not suitable for a formation shut off with a long shoe.

The process may reasonably be presumed to accomplish several things greatly to be desired in California, especially a reduction in cost of drilling wells. However, as the State Mining Bureau is engaged in practical work, theory can not be the sole recommendation of this or any other problem. Doubtless some operators will be more than willing to immediately use the mud fluid method of shutting off water as it will be much less expensive than the ordinary methods now in use.

It is recommended that a limited number of wells be permitted to drill with the mud fluid process in selected localities where the after effects can be definitely studied, and if necessary, corrected without undue injury to surrounding property. The work should be allowed to proceed only under definite specifications to be furnished by the State Mining Bureau, which welcomes suggestions as to the specifications.

SPECIFICATIONS FOR DRILLING WITH MUD.

The following specifications are presented with the understanding that we do not believe them to be incapable of improvement. The bureau welcomes the introduction of new methods and will gladly confer with any operator on such questions.

(1) The work must at all times be open to the inspection of all operators owning land or operating wells within one mile of the well, and any reasonable information as to the operations must be furnished them.

(2) The mud must be entirely free from sand or grit.

(3) Constant circulation of mud must be maintained during operations until casing is ready to land. Just before the casing is landed the exit of mud from the well must be stopped and pumping continued at a pressure of five hundred pounds per square inch until no more mud can be pumped into the well. After the casing is landed the level of the mud behind it must be kept permanently at the ground surface.

(4) The casing must be landed in some thick bed of sticky clay. Before landing the casing, a hole two inches smaller in diameter than the shoe must be drilled at least three feet below the larger hole.

(5) A casing shoe not less than three feet long must be used. The outside diameter at the point of the shoe must not be larger than at any point above.

(6) Proof will be required that the casing is securely and tightly landed. The well must be drilled at least five feet below the shoe, bailed dry and allowed to stand at least twenty-four hours.

COLLAPSING STRENGTH OF STEEL CASING.

The question of strength of casing to resist collapse is of vital importance to oil operators contemplating deep wells because it must be remembered that after the well is completed it will some times stand nearly empty and therefore the casing will be subject to the maximum pressure of the column of water outside it. Casing which is too light is the poorest kind of false economy.

When a test of the water shut-off is made at a well by the Petroleum Department of the State Mining Bureau, it is desirable to bail the well down as far as is safe, and the accompanying table showing the strength of various sizes and weights of casing is presented as a rough guide. The list is based on a great number of actual tests conducted by Prof. Reid T. Stewart (Vol. 27, Transactions American Society of Mechanical Engineers), and the figures for depth of water exerting pressure enough to collapse casing is the limit beyond which safe operations would not extend. A prudent operator would stop far short of the limit. It must be remembered that in this list no account is taken of such underground forces as are sometimes reported to have cut off and carried casing to one side and out of reach of the drilling tools. It should be further remembered that when any force is suddenly applied it is much more destructive than when gradually applied, and if a well were suddenly emptied of its fluid content, as in the case of a gas blow-out, the casing might fail under a water pressure that could have been supported if the well were emptied slowly by a bailer or pump. The depth of water is of course sometimes much less than the depth of the well and it is important to always note the level of the fluid which will stand outside of the casing.

Care of casing before it is used is of vital importance. Tests show that when the casing is slightly flattened, or out of round, failure takes place most easily. In handling casing it is frequently allowed to fall and become bruised or dented, thereby inviting collapse when it is later used in a well.

Size of casing (nominal)	Weight per foot, pounds (nominal)	Collapsing strength, pounds per square inch	Depth of water exerting pressure enough to collapse casing (feet)
4¼-inch	16	4,715	10,880
4½-inch	13	2,900	6,700
4½-inch	15	3,605	8,320
5⅝-inch	20	3,295	7,620
6¼-inch	20	2,345	5,420
6¼-inch	24	3,215	7,420
6¼-inch	26	3,650	8,420
6¼-inch	28	4,080	9,420
6⅝-inch	20	1.980	4.570
6⅝-inch	26	3,075	7,080
6⅝-inch	28	3,490	8,060
6⅝-inch	30	3,850	8,900
7⅝-inch	26	1,945	4,480
8¼-inch	28	1,660	3,840
8¼-inch	32	2,150	4,960
8¼-inch	36	2,635	6,080
8¼-inch	38	2,880	6,640
8¼-inch	43	3,510	8,100
9⅝-inch	33	1,285	2,970
10 -inch	40	1,425	3,290
10 -inch	45	1,795	4,140
10 -inch	48	2,025	4,680
10 -inch	54	2,510	5,800
11 -inch	47	1,375	3,175
11 -inch	60	2,215	5,100
11⅝-inch	40	835	1,930
12½-inch	40	500	1,150
12½-inch	45	750	1,730
12½-inch	50	1,010	2,330
12½-inch	54	1,215	2,800
13½-inch	50	650	1,500
15½-inch	70	795	1,840

Table Showing Capacity of Tubing, per Lineal Foot, in Gallons and Cubic Feet.

Nominal inside diameter	Weight per foot, pounds	Actual outside diameter, inches	Actual inside diameter, inches	Capacity per foot	
				Gallons	Cubic feet
1¼-inch	2.24	1.660	1.390	.079	.0105
1½-inch	2.68	1.900	1.622	.1078	.0144
2 -inch	4.00	2.375	2.021	.1661	.0222
2 -inch	4.50	2.375	1.971	.1582	.0212
2½-inch	5.74	2.875	2.461	.2470	.0330
2½-inch	6.25	2.875	2.433	.2420	.0323
3 -inch	7.54	3.500	3.080	.3870	.5180
3 -inch	8.50	3.500	3.018	.3720	.0497
3 -inch	10.00	3.500	2.914	.3460	.0463
3½-inch	9.00	4.000	3.558	.5160	.0689
4 -inch	10.65	4.500	4.022	.6600	.0882
4 -inch	11.75	4.500	3.980	.6510	.0870

Table Showing Capacity of Casing, per Lineal Foot, in Gallons and Cubic Feet.

4¼-inch	16.00	4.750	4.082	.680	.091
4½-inch	12.85	5.000	4.506	.830	.116
4½-inch	15.00	5.000	4.424	.799	.107
5⅝-inch	20.00	6.000	5.352	1.170	.156
6¼-inch	20.00	6.625	6.049	1.490	.199
6¼-inch	24.00	6.625	5.921	1.430	.191
6¼-inch	26.00	6.625	5.855	1.400	.187
6¼-inch	28.00	6.625	5.791	1.365	.182
6⅝-inch	20.00	7.000	6.456	1.700	.227
6⅝-inch	26.00	7.000	6.276	1.610	.215
6⅝-inch	28.00	7.000	6.214	1.580	.211
6⅝-inch	30.00	7.000	6.154	1.546	.206
7⅝-inch	26.00	8.000	7.386	2.224	.296
8¼-inch	28.00	8.625	8.017	2.625	.350
8¼-inch	32.00	8.625	7.921	2.560	.343
8¼-inch	36.00	8.625	7.825	2.500	.334
8¼-inch	38.00	8.625	7.775	2.470	.330
8¼-inch	43.00	8.625	7.651	2.390	.320
9⅝-inch	33.00	10.000	9.384	3.600	.480
10 -inch	40.00	10.750	10.054	4.130	.552
10 -inch	45.00	10.750	9.960	4.060	.543
10 -inch	48.00	10.750	9.902	4.020	.537
10 -inch	54.00	10.750	9.784	3.900	.522
11⅝-inch	40.00	12.000	11.384	5.290	.706
12½-inch	40.00	13.000	12.438	6.300	.843
12½-inch	45.00	13.000	12.360	6.230	.834
12½-inch	50.00	13.000	12.282	6.140	.821
12½-inch	54.00	13.000	12.220	6.090	.814
13½-inch	50.00	14.000	13.344	7.280	.973
15½-inch	70.00	16.000	15.198	9.420	1.260

STATISTICS OF OIL PRODUCTION.

The statistics of oil and gas production, together with financial results of the industry, for the calendar year 1916, are fully set forth in Bulletin No. 74, of this bureau.

Monthly statistics for various fields and for the entire state are here given for the purpose of bringing records previously published in Bulletins Nos. 69 and 73 down to date. The figures in uniformity with previous publications are those collected by the Standard Oil Company.

They closely check those published by the Independent Oil Producers Agency and also the figures collected by this department in the form of sworn statements.

KERN RIVER.

	Number of wells		Average daily production in barrels	
	Producing	Completed	Total	Per well
1916—July	1,838	12	22,280	12.1
August	1,838	8	22,550	12.3
September	1,859	13	22,600	12.2
October	1,886	9	23,075	12.2
November	1,900	13	22,595	11.9
December	1,908	8	22,495	11.8
1917—January	1,927	5	23,645	12.3
February	1,935	4	24,410	12.6
March	1,946	6	24,445	12.5
April	1,953	2	23,875	12.2
May	1,954	3	23,595	12.1
June	1,955	5	23,030	11.8

McKITTRICK FIELD.

	Number of wells		Average daily production in barrels	
	Producing	Completed	Total	Per well
1916—July	288	3	9,504	33.0
August	290	----------	8,876	30.6
September	290	1	9,650	33.3
October	292	2	9,502	32.6
November	294	1	9,582	32.6
December	293	3	8,812	30.1
1917—January	290	2	9,278	32.0
February	290	2	8,678	29.9
March	293	2	9,308	31.8
April	298	2	9,596	32.2
May	301	3	9,185	30.5
June	302	2	9,069	30.0

MIDWAY-SUNSET.

	Number of wells		Average daily production in barrels	
	Producing	Completed	Total	Per well
1916—July	1,592	22	107,624	67.5
August	1,622	18	108,280	66.8
September	1,659	20	111,988	67.5
October	1,682	14	112,635	66.9
November	1,693	19	108,327	64.0
December	1,710	19	102,217	59.9
1917—January	1,713	28	101,503	59.3
February	1,742	16	100,980	57.9
March	1,762	21	100,789	57.1
April	1,781	38	101,723	57.1
May	1,814	23	99,832	55.0
June	1,842	19	99,543	54.1

LOST HILLS AND BELRIDGE.

	Number of wells		Average daily production in barrels	
	Producing	Completed	Total	Per well
1916—July	297	10	13,239	44.6
August	302	14	14,155	46.8
September	319	14	14,232	44.6
October	336	8	14,820	44.1
November	342	10	14,754	43.1
December	350	9	14,719	42.1
1917—January	359	6	14,807	41.3
February	365	12	15,729	43.1
March	376	18	16,803	44.7
April	392	9	17,394	44.4
May	398	3	17,010	42.8
June	412	12	17,456	42.4

COALINGA.

	Number of wells		Average daily production in barrels	
	Producing	Completed	Total	Per well
1916—July	903	5	43,627	48.3
August	914	2	43,615	47.7
September	925	5	44,052	47.6
October	935	4	44,052	47.2
November	927	1	44,291	47.8
December	949	5	43,215	45.5
1917—January	939	4	42,683	45.5
February	941	5	42,486	45.0
March	942	10	42,902	45.5
April	961	7	46,841	48.7
May	982	8	44,644	45.5
June	988	7	42,192	42.7

LOMPOC AND SANTA MARIA.

	Number of wells		Average daily production in barrels	
	Producing	Completed	Total	Per well
1916—July	239	----------	12,895	53.9
August	235	2	12,705	54.1
September	244	1	12,330	50.5
October	248	----------	12,850	51.8
November	248	----------	13,075	52.7
December	249	1	12,890	51.7
1917—January	250	5	13,370	52.5
February	254	5	13,865	54.5
March	259	2	14,509	56.0
April	256	3	14,575	56.9
May	258	3	14,300	55.4
June	258	4	15,680	60.7

VENTURA-NEWHALL.

	Number of wells		Average daily production in barrels	
	Producing	Completed	Total	Per well
1916—July	448	1	3,067	6.8
August	436	1	2,962	6.8
September	435	1	2,786	6.4
October	429	3	2,861	6.7
November	438	----------	2,893	6.6
December	446	2	2,882	6.5
1917—January	449	2	2,868	6.4
February	444	3	2 986	6.7
March	446	1	2,998	6.7
April	458	----------	2,923	6.4
May	452	3	3,051	6.7
June	454	5	3,414	7.5

LOS ANGELES AND SALT LAKE.

	Number of wells		Average daily production in barrels	
	Producing	Completed	Total	Per well
1916—July	675	----------	4,782	7.1
August	675	1	4,439	6.6
September	674	1	4,483	6.6
October	675	----------	4,417	6.5
November	675	----------	4,654	6.9
December	674	----------	4,396	6.5
1917—January	675	----------	4,244	6.3
February	672	----------	4,389	6.5
March	673	----------	4,074	6.1
April	674	----------	4,525	6.7
May	671	----------	3,765	5.6
June	670	----------	4,179	6.2

WHITTIER-FULLERTON.

	Number of wells		Average daily production in barrels	
	Producing	Completed	Total	Per well
1916—July	632	5	41,145	65.2
August	642	5	41,645	64.9
September	647	6	43,163	66.7
October	655	3	42,078	64.3
November	658	4	42,808	65.0
December	637	9	44,127	69.2
1917—January	661	5	49,251	74.5
February	667	7	48,775	72.0
March	672	1	47,455	70.6
April	674	2	47,403	70.4
May	676	4	45,392	67.1
June	679	5	44,184	65.0

SUMMERLAND.

	Number of wells		Average daily production in barrels	
	Producing	Completed	Total	Per well
1916—July	112	----------	155	1.4
August	112	----------	155	1.4
September	112	----------	155	1.4
October	112	----------	155	1.4
November	112	----------	155	1.4
December	112	----------	155	1.4
1917—January	112	----------	155	1.4
February	112	----------	155	1.4
March	112	----------	155	1.4
April	112	----------	155	1.4
May	112	----------	155	1.4
June	112	----------	155	1.4

WATSONVILLE.

	Number of wells		Average daily production in barrels	
	Producing	Completed	Total	Per well
1916—July	5	----------	75	15.0
August	5	----------	75	15.0
September	5	----------	75	15.0
October	5	----------	75	15.0
November	5	----------	75	15.0
December	5	----------	75	15.0
1917—January	5	----------	75	15.0
February	5	----------	75	15.0
March	5	----------	75	15.0
April	5	----------	75	15.0
May	5	----------	75	15.0
June	5	----------	75	15.0

GENERAL REGULATIONS FOR ORGANIZATION AND CONDUCT OF THE DEPARTMENT OF PETROLEUM AND GAS.

The system developed within the department of petroleum of the State Mining Bureau for the purpose of most effectively conducting its technical work may be of public interest in view of the foregoing statements showing the necessity of more technical work by large oil producing concerns. The following regulations have been developed by the supervisor during the past two years and are not presented as being perfect but rather with the idea that some features may be useful to other concerns carrying on similar work.

Successful administration of the law under which this department operates depends upon harmonious and intelligent action of all members of the department. These instructions are issued to members of the department for the purpose of outlining the plan upon which the department is organized and such regulations as are necessary. It is not intended to enforce uniformly mechanical operations. Each individual is expected to make suggestions, through regular channels, with the idea of improvement in our work. No member of the department is permitted to engage in private work, involving the oil business in California.

The supervisor is subordinate to the State Mineralogist, and attends to general questions such as the policy of the department in its relations to the public and with other public departments. He also covers intradepartmental matters affecting the various districts. All public reports and statements as well as formal orders are issued by the supervisor. Legal actions are started at the direction of the supervisor.

The chief deputy will, in the absence of the supervisor, or under special orders, perform the duties of the supervisor.

The deputy supervisors are responsible to the supervisor for all details of technical and adminnstrative work within their respective districts. Questions of general policy of doubtful problems will be referred to the supervisor.

It is essential that recommendations as to work at wells be made by a man on the ground and familiar with local conditions. Therefore the supervisor will not make recommendations on such operations until they have been passed on by the deputy. Reversal by the supervisor of a deputy's recommendation will only be made after careful review and discussion with the deputy and the party requesting the review.

The various districts are prescribed by law in such manner as to cover the entire state, but the deputies are required to confine their work to only those portions of their districts generally considered as active or productive oil fields. A deputy will absent himself from his regular place of duty, except during holidays and Sundays, only after communication with the supervisor. It is absolutely necessary that the whereabouts of all deputies be at all times known to the supervisor, for the reason that immediate communication is frequently necessary.

Petroleum engineers, inspectors and office assistants report directly to and receive orders directly from the deputy in charge of the district to which they are assigned. All communications from an officer subordinate to a deputy and dealing with the work of the department must be addressed to the deputy.

Vacations are provided for under regulations issued by the Civil Service Commission and the Board of Control.

Request for leave of absence must be transmitted by the deputy of the district, with his recommendations, to the supervisor.

All expenditures must be made in accordance with regulations issued by the secretary of the State Mining Bureau. All requisitions, expense accounts and vouchers must be approved by the deputy in charge of the district and forwarded by him to the secretary.

Circular letters on specific subjects, insuring uniformity of practice in minor details of our work, are issued from time to time to the various deputies. Each deputy is expected to be familiar with the circulars and also to see that they are brought to the attention of all members of his staff.

GENERAL REQUIREMENTS GOVERNING MEMBERS OF THE DEPARTMENT OF PETROLEUM AND GAS.

In view of the number of subordinate officers in the employ of this department, it has become desirable to acquaint them with our general policy relative to retention or advancement in the service.

The department is primarily required to furnish technical assistance to oil operators, or, in other words, we are largely concerned in solving problems requiring technical training. Most of the conditions leading to the passage of the law under which we operate were not brought about by lack of mechanical skill on the part of workmen at the wells. The damaged condition of the oil deposits is due primarily to the fact that most operators have failed to study underground conditions and carefully plan their development work to meet such conditions.

Therefore, in choosing new employees, more stress is laid on mental training and alertness than on mechanical experience and dexterity. Education and experience have been considered, but it must be emphasized that neither of these qualifications will, by themselves, bring advancement. We specially need men who are mentally vigorous and interested in thorough and correct solutions of the problems coming before us. *In fact, the solution of the problems must actually and naturally be a pleasure to a man if he is to succeed in the work.* This is a condition prevailing in all branches of engineering work.

We shall frequently be unable to specifically point out to other members of the staff more than the general method to be pursued in solving a problem. With even greater frequency we shall be unable to supply them with all the facts necessary for a correct solution. In order to succeed in the work, a man will therefore have to rely principally upon his own resourcefulness, always remembering that we must finally have a definite and concise answer to the problem. This will not conflict with the fact that some of the problems can not be solved with any of the data obtainable, but in such case we shall expect a clear demonstration proving the impossibility of solution.

It may be necessary for some men, who have had considerable so-called ''practical'' experience in the oil fields, to actually unlearn or forget some theories which may have appeared to them as facts. In reality there are too few known facts relative to the conditions with which we have to deal. A statement that a proposition should be considered in a certain way, merely because it has been so considered in the past, has little or no force in this department.

The foregoing statements must not be interpreted as a statement that we are without any definite methods of procedure. On the contrary, the past two years have enabled us to outline certain plans and establish some definite forms necessary to the carrying on of our work. New members of our staff will be expected to become thoroughly familiar with such methods as we have perfected, and the deputies will arrange work so as to facilitate such schooling.

It is specially important that all members of the staff shall be able to briefly and correctly write reports so that other persons, upon reading the reports, will be entirely informed, and not require further explanations. It must be remembered that our correspondence and reports may at any time come before contending parties, intent upon twisting words into various meanings. This apparently simple accomplishment of writing reports is, in fact, one of the most difficult and will require constant study and practice.

Accuracy of observation and statement are absolutely essential. It is inexcusable to state that a measurement is ''about'' so much, if it is practicable to give the exact figures. On the other hand, it frequently happens that an approximate figure is sufficient, but the same care in wording must be used so that the reader will recognize the fact that the writer had merely approximated.

It is assumed that all members of our staff have the elementary virtues, such as honesty, punctuality and industry.

This letter, issued to members of the department, may appear too long, but, as a matter of fact, it merely hints at subjects requiring close application and constant study. It should be impressed upon all subordinate officers that we need and expect their utmost endeavor and co-operation, and that in turn we aim to assist them in improving their own opportunities for advancement. Such opportunities exist within the department, but advancement will come only to those who "deliver the goods."

EFFICIENCY RECORDS OF MEMBERS OF THE DEPARTMENT.

The policy of basing promotion of subordinate officers upon efficiency requires the installation of a system for recording their performance. A record is made each week on a form listing the decisions rendered by a deputy supervisor. Columns are provided on the form for each engineer or inspector in the district.

A rating number is given by the deputy to each report (either form 109 or 111). The rating is placed in the column of the officer who has furnished the data upon which the report is based.

Rating is based on two features: First, accuracy and completeness in observing and recording facts; second, correctness of conclusions drawn from observed facts. Rating is applied to the written data furnished to the deputy by the inspector or engineer. The rating is made by the deputy at the time he receives the data and prior to the writing of the final report signed by the deputy.

There are three grades, as follows:

> *First Grade* (recorded by figure "1") is given for data correct and complete both as to facts and conclusions.
>
> *Second Grade* (recorded by figure "2") is given for data which are correct and complete as to facts, but which need revision as to the written conclusions.
>
> *Third Grade* (recorded by figure "3") is given for data incorrect as to facts.

Lists showing the average rating of all subordinate officers in the department will be distributed by the supervisor to all deputies from time to time.

The figures obtained by this rating will be an important guide in determining efficiency, but will not be the sole source of information.

The proper handling of reports upon *proposed operations* will indicate greater ability than will an equal rating based entirely upon reports of *tests*.

Supplementary information as to personality (ability to deal with the public), initiative, promptness, and similar important points, will, from time to time, be compiled by the supervisor and deputies, in conference.

WEEKLY WORK REPORTS BY ENGINEERS AND INSPECTORS OF THE DEPARTMENT.

Each engineer or inspector in the department fills out a weekly report showing disposition of his time.

INDIVIDUAL WORK REPORT.

Week ending .... 191....

(Signed) ....

(Inspector-Engineer)

	Field work					Office work		
	Tests			Special investigations, surveys, etc., hours	Auto miles	Reports on field work, hours	Recommendations, special reports, hours	Drafting or models, hours
	Routine, number	Special, number	Hours					
Sunday								
Monday								
Tuesday								
Wednesday								
Thursday								
Friday								
Saturday								

Suggestions: ....

This report is to be filled in by the engineer or inspector each evening with approximate figures. The deputy will send this report to the supervisor and retain a copy. The purpose of the report is to determine the best disposal of available time and men. It is not for the purpose of speeding the men, as accuracy is of prime importance.

The headings of the various columns are more completely defined as follows:

1. Routine tests are those involving the bailing down of a well, measurement of casing, bottom fluid level, etc.

2. Special tests are those involving the witnessing of such operations as mudding, cementing or testing of plug to see whether it has set.

The total number of each sort of test made in a day is to be recorded in the appropriate column. The total number of hours involved in such field work should be recorded in the appropriate column.

3. Special investigations, surveys, etc., include such work as the visiting of wells or properties for the purpose of gathering information not covered by tests. The total number of hours per day consumed by such work should be covered.

4. The total number of miles travelled by automobile, on field work alone, should be recorded each evening.

Under the heading of office work, the columns are as follows:

5. Reports on field work include the writing up of such field notes and conclusions as may follow tests.

6. Recommendations and special reports cover the time involved in searching through our records and the writing of a tentative report upon proposed operations or an engineering investigation of a property.

7. Drafting or models is self-explanatory, and includes the work or maps or making of models.

8. Suggestions. These three lines are intended to give the inspector or engineer an opportunity to suggest anything he may deem advisable looking to the improvement of the work coming under his observation. Suggestions should be made with considerable care, as they will clearly indicate the writer's grasp of the subject upon which he makes suggestions.

METHOD OF TESTING WATER SHUT OFF AT OIL WELLS.

Time and expense will be saved to well owners if the following steps are taken in preparing a well for inspection by the State Mining Bureau:

1. Measurements to the bottom of the hole and to the bottom of the casing shoe must both be carefully checked before the casing is landed or cemented and before notifying the deputy supervisor of intention to test. A steel tape should be used in determining the distance that the sand line or drilling line "measures over."

2. Casing must be tested by bailing the well to a safe depth (see collapsing strength of casing, page 46) before drilling below the shoe. Old casing may collapse with less pressure than that indicated for new casing. Testing by applying pump pressure inside the casing will not always reveal leaks.

3. Drilling out of cement or other material in the casing must be carefully done to avoid damage to the shut-off. The drill must merely be run far enough to go entirely through the cement and below the shoe. A distance of from five to ten feet below the shoe should be ample. By drilling too far below the shoe complications may arise which will prevent a positive test.

4. Bailing should, if possible, continue until all fluid is removed from the hole, unless there is danger of collapsing the casing. It is advisable to run the bailer until it brings up nothing but mud on the last run, then allow the well to stand an hour or more and again bail to remove water which has sprayed onto the inside of the casing and drained down. When a well is in such condition that it can not be safely bailed dry,

the fluid should be lowered to a certain depth by continuously running the bailer to that depth until no more fluid is brought up. A permanent target should be placed on the line to mark the bailing point. If both oil and water are present in a well which can not be bailed dry, it may be necessary to remove the water by continuously bailing it from the bottom of the well until the bailer fails to bring up water. The well should be allowed to stand several hours and the bailer run to increasing depths to determine the point where it again picks up water. At this point the well is ready for inspection by the deputy supervisor and afterwards the water may again be removed by bailing from the bottom of the well, account being kept of the amount bailed out. It may be necessary to repeat this process several times in order to determine whether the water is being exhausted. In case of high pressure and flow of gas, or in case of heaving formation, it will probably be possible to only test the well by pumping.

5. When a tight or closed bailer is used in a deep well, some sort of outlet or valve should be provided in order to relieve the pressure, which may endanger the lives of persons in the derrick when the bailer comes out of the well.

A leaky bailer should not be used in testing.

6. A well must stand *at least twelve hours without any bailing whatever* before it is to be witnessed by a representative of the bureau, and a longer time is preferable.

7. The law requires that the bureau be given written notice at least five days before a test. It will save time for both the operators and the state officials if additional notice of the exact time be given by telephone.

A proper test to determine whether or not a sand carries oil or water can not be made unless water from all other possible sources is absolutely excluded. This fact is well known to all careful operators, but the officers of this department have frequently heard contrary arguments advanced and it may be of interest to give the details of a single case, illustrating a common occurrence.

At well No. 80 of the Petroleum Development Company, Sec. 8, T. 3 S., R. 9 W., S. B. B. & M., in the Olinda field, a ''dry sand'' was reported in the log between depths of 1015 ft. and 1029 ft. While drilling the hole was carried full of water. When the bottom of the hole was at the last mentioned depth a string of casing was landed at a depth of 988 ft. After the casing was landed bailing commenced, and upon lowering the water to a depth of 200 ft. oil began to show. All the fluid was bailed from the well and after standing 29 hours the hole filled with oil up to a depth of 128 ft. from the surface.

If such a bailing test had not been made a productive sand would have been passed through without its value being recognized.

There is no doubt that in the past many productive sands have been so passed. The requirements of this department now prevent such losses.

When gas is flowing, in large quantities and under great pressure, from a well it is sometimes difficult to determine whether or not water has been properly shut off. It has frequently been assumed that a constant flow of dry gas showed that the water had been shut off. There is, however, a possibility that the gas pressure may be great enough to hold back water which would otherwise enter the well. That such is actually the case is shown by the following occurrence.

At well No. 12 of the Honolulu Consolidated Company, Sec. 10, T. 32 S., R. 24 E., M. D. B. & M., in the Midway field, a test of water shut-off was made by merely observing the dry gas blowing from a two-inch opening. The test was not considered conclusive by this department and the well was passed for further observation after the well should be producing. About a week later the well for some reason got out of control and gas flowed at a rate estimated at from five to seven million cubic feet per day. Accompanying the gas was water amounting to about 700 bbls. per day. Within a day or two the well was again capped and the flow of water was reported as decreasing. The well can of course be properly repaired, and the occurrence is here reported merely to show that dry gas may come from a well which may also contain water.

RULES FOR MEASURING DEPTH OF WELLS AND CASING.

Methods of measuring the depth of oil wells, and the amount of casing put into them, are of extreme importance in order that water shall be shut off at the proper depth and casing perforated between the proper depths. While the matter may appear of slight importance to some careful operators, it has been found that gross errors are frequent enough to justify some general regulations.

In order that the advice and suggestions of skilled oil-well workers might be had before rules were adopted by the State Mining Bureau, letters were written to all authorized agents appointed by the oil producers of California. About fifty replies were received and the comments carefully studied. These replies, together with the experience of officials of this department, serve as the basis for the following regulations, which will hereafter be applied to work passed on by the State Oil and Gas Supervisor.

1. All measurements must be made with a steel tape. Cloth or metallic tapes can not be depended upon, as they are subject to great change in length. A five-foot stick used on a sand or drilling line, for distances

more than two hundred feet, is inaccurate. The reasons for such inaccuracy are that exact markings on the line at the ends of the stick are difficult to make and their great number quickly multiplies the error.

2. The depth of well shall *in all cases* be determined by running a bailer or string of tools to the bottom. The unit of measurement, when cable tools are used, shall be the distance from the floor of the derrick along the sand line over to a point level with the top of the flanges of the reel. This is commonly known as the distance the derrick ''measures over,'' and details for such measurement are stated below. If measurement is on the drilling line, it shall be from the floor over to a point near the bull wheel and five feet above the floor, as determined by setting up a five-foot stick.

The depth of a rotary hole, before casing is put in, shall be determined by measuring each stand of drill pipe with steel tape, measurement to be from top of tool box joint to bottom of shoulder on tool joint pin.

3. The length of a string of casing shall, *when considered necessary by the supervisor or deputy,* be determined by measuring to the shoe of the casing from the derrick floor. This measurement can be made on the drilling line by using an under-reamer, a latch-jack, or any other tool which definitely locates the shoe of the casing.

4. A derrick should be ''measured over'' immediately before it is intended to measure the depth of well or of casing. A measurement made when the rig is new may not be correct after the rig and rig irons have been in use for some time.

The ''distance over'' can be determined in the following manner, using a bailer and sand line:

(*a*) Run the bailer into the well a short distance and tie string on the sand line level with the surface of the floor, using a straight edge or steel square to determine the correct position.

(*b*) Tie a strand of rope (target) tightly on the sand line at a position on a level with the top of sand reel flanges, laying a straight stick on top of the flanges to determine this position.

(*c*) Lower the bailer into the well until the target is within easy reach from the derrick floor. Attach the end of a steel tape to the sand line at the target. Raise the bailer until another target can be fastened at the end of the tape and tie another target. Lower the bailer, detach tape, hoist bailer and attach tape at the second target, hoist bailer and set a third target. Repeat the operation until it is possible to measure with the tape to the target first set at the floor. The tape must be shorter than the height of the derrick, so that it will not go over the pulley at the crown block.

When a target is tied to the line, paint should be put on the line above and below the target, to show any displacement of the target.

To measure into the well, after the unit length or ''distance over'' is determined, hold the bottom of the bailer dart, when raised, level with the surface of the floor, set a target at the top of the flanges of the reel, lower the bailer until the target is level with the floor, and set a second target at the reel. Correct count of the targets is most easily kept by detaching and keeping each one as it reaches the floor.

The depth can also be conveniently measured when the bailer is pulled out of the well by setting the first target even with the floor, while the bailer is on bottom, hoisting until the target reaches the flanges of the reel, set new targets at floor level and remove old ones as they reach the reel.

GENERAL REQUIREMENTS FOR ABANDONING OIL AND GAS WELLS.

In the abandonment of wells drilled in the vicinity of petroleum and gas deposits, the State Oil and Gas Supervisor will require sufficient work to protect the deposits from damages by infiltrating water and other causes. Conditions vary from well to well, so that definite rules seem impossible, and final determination of the requirements for each individual case will be made by the deputy supervisor in charge of the district where a well may be located. However, the requirements will conform as far as possible to the general policy herein set forth.

1. The law requires that the State Oil and Gas Supervisor be given written notice of intention to abandon a well five days before work is to begin. The notice should state the reason for abandonment, and must also state in detail the proposed method of abandonment. Blank forms for this purpose may be obtained at any office of the department. A log of the well, written in duplicate on forms furnished by the supervisor together with a complete statement of the present condition of the well, must be filed before approval of the proposal will be granted.

In case of an emergency, where the operator desires to act immediately, he should telephone the deputy supervisor, who will expedite matters as much as possible in compliance with the law.

2. When the depth or location of a well show to the satisfaction of the deputy supervisor that no oil or gas bearing formations have been penetrated, approval may be given to a proposal contemplating the removal of all casing without the placing of any plugs. This will only cover very exceptional cases.

3. In most cases sufficient casing should be left in a well to serve as a conductor from the ground surface to the point of shut-off. The desirability of such a requirement is based on the fact that it is frequently impossible to immediately and directly prove the effectiveness of plugging. It may be necessary to note the behavior of neighboring wells for a considerable period of time before it is known that plugging

is effective. In some cases the condition of surrounding wells may demonstrate that plugging was not effective and that further work is necessary at the abandoned well. The well could not be economically entered if all casing had been removed. Furthermore, it is believed that in most wells it does not pay to attempt to pull casing below the shoe of the next larger casing, as ordinarily only one or two joints of casing in contact with the walls of the hole can be recovered.

4. It is generally required that cement plugs be put in between various zones of oil or gas producing formations, in order to prevent the possible passage of water from one stratum to another in the future. In most wells it will be necessary to remove or shoot casing between depths at which plugging should be done, so that cement may reach the walls of the well. Wells which have sidetracked casing would require a larger shot than those which have not such casing. The casing in a well, between the shoe of the water string and a point at least fifteen feet below, should be pulled out or broken up by shooting, and the well should be plugged with cement in the formation between these depths and up into the water string for at least twenty feet.

5. In case of effective water shut-off, wells, which do not have suitable formation in which to plug below the shoe of the water string, should be plugged inside of such string for at least twenty feet directly above the shoe.

6. Each cement plug put into a well must be allowed to set at least 24 hours (a longer time is advisable), after which determination must be made that the cement properly sets before further plugging is done.

7. When a well is making ''bottom'' water, the level at which fluid (water and oil) stands in the well should be accurately determined both before and after plugging in the bottom. If possible the well must be plugged in a formation which may separate water bearing from overlying oil or gas formations. The well must be tested by bailing to determine the effectiveness of the plugging, and such test must be witnessed by a representative of the state supervisor. After approval of such test has been given, the well should be plugged further along the lines indicated in paragraphs 4 and 5.

8. When a well is making ''top'' water around the shoe of the water string, it will be necessary, in addition to the plugging between formations, as required in paragraphs 4 and 5, to place a cement plug in suitable formation directly below the water string. If suitable formation for plug is present, the water string should be shot or removed above the shoe at a point opposite impervious formation, and a cement plug should be placed in bond with the formation where casing was shot or removed.

9. When a well is making "top" water through the water string, it should be plugged as provided in paragraphs 4 and 5.

10. When a well penetrates "intermediate" water below the water string, it should be plugged in formation which may separate water bearing formations from the overlying and underlying oil or gas bearing formations. The depths to the fluid level should be measured and the well tested to determine the effectiveness of the plugging, as indicated in paragraph 7.

11. When a well penetrates "intermediate" water above the shoe of the water string, and mud laden fluid or cement have been effectively used for the protection of oil or gas bearing formations, back of the casing, the water string should not be disturbed unless it is proposed to put in cement plugs between oil and gas bearing formations. Where the original protection by mud or cement was ineffective, it will be necessary to shoot or rip the water string at places where plugs will be required to separate and protect oil or gas bearing formations. To test the effectiveness of the original protection, the water string should be perforated or ripped opposite the oil or gas bearing formations. If the test demonstrates proper protection, the casing should be plugged to points at least ten feet above and below the perforation or ripping, to seal the openings in the casing. A water string which protects with the aid of cement and mud, oil or gas bearing formations behind the casing, may be cut off (not shot) about twenty feet above the shoe at the next larger casing. A cement plug must then be placed at the top of the casing.

12. When the source of water can not be definitely determined, it will be necessary to combine all the requirements for various known sources.

13. Attention is called to the fact that in some cases shooting is inadvisable, as it may break up formations depended upon to prevent the passage of water. In many such cases the casing may be cut into five-foot lengths, thoroughly ripped, and pounded down with the tools.

14. It seems probable that *mud laden fluid*, when properly introduced into a well, will serve to effectually and economically close all openings through which fluid might pass. More than ordinary care is necessary in the use of this method, which has been fully described in Bulletin No. 134 of the U. S. Bureau of Mines, Washington, D. C. The subject is also covered in the first annual report of the state supervisor (pages 217 to 222), and on pages 43 to 45 of this report. Operators are urged to carefully consider the advantages of this method.

15. Approval of completed abandonment work will be given by the supervisor only upon a satisfactory showing that it has been done according to specifications issued by this department at the time of

the proposal. The operator is advised to keep the deputy supervisor informed as to the progress of the work, so that inspection can be made whenever deemed necessary. Such procedure will serve to insure the operator against future complaints and also save him expense. It will also be necessary for the operator to file with the deputy supervisor a sworn statement, written in duplicate, giving all details of the completed work. The statement must give the following information:

(*a*) Names of all workmen employed on the job.

(*b*) Dates when work was commenced and completed, and additional dates of particularly important features of the work.

(*c*) Depth to which hole was cleaned out.

(*d*) Depths at which casing was cut, ripped or shot, together with kind and amount of explosive used in the various shots.

(*e*) Amounts and sizes of all casing removed from the well.

(*f*) Depths at which plugs were placed, together with statement of kinds and amounts of materials composing each plug, together with statement of tests made to prove effectiveness of all plugs.

Properly kept tour reports or diary will furnish the required information without inconvenience to the operator.

PEG MODELS.

Rods or pegs set in proper relative positions both horizontally and vertically and colored to represent formations encountered in a bore hole have for many years been used in connection with mining operations. Such models give a mental impression which is not so readily obtained from cross-sections or contour maps. This department is engaged in constructing such models as fast as the size of our staff permits and hopes to eventually cover all areas where geological conditions are complex.

Considerable effort has been given to devising uniform specifications which will meet the necessities of economy in time, labor and material, and at the same time show the maximum amount of information. The future should see many similar models constructed by oil operators and our specifications are therefore published in the hope of offering some suggestions.

Our models are made entirely of wood on a scale of 100 ft. to the inch.

Each model covers one quarter section of land. Skeleton tables support four of the quarter section models.

The baseboard is of clear pine surfaced to a thickness of 1¼ inches. A blue print map showing wells, property lines and names is pasted on the baseboard and holes bored to receive a peg at each well location. The pegs are ½ inch in diameter. A blue-printed graphic log, showing the casing in detail and also the geological formations, (see cut, page 21) is pasted on the peg. The pegs fit in the baseboard.

Strings are fastened from peg to peg, correlating the important formations. Red strings denote oil bearing formations. Yellow strings denote water bearing formations.

Pins with colored spherical heads about $\frac{1}{8}$ inch in diameter are also stuck in the pegs to call attention to specially important features, such as point of shut-off or bottom of open hole.

Productiveness, both oil and water, can be conveniently brought to attention by small colored tabs or flags in the top of the pegs.

AMENDED LAW.

Administration of the law as first enacted developed minor deficiencies, as was expected by the framers. Prior to the legislative session of 1917 the State Mining Bureau prepared amendments and mailed copies to all oil operators. The proposals covered two main features, namely, administrative details and method of levying assessment.

The principal change from the original law, in addition to those suggested by this department, is the formation of boards of commissioners to perform the duties previously left to special boards of arbitration.

The advisability of depending upon elective boards to decide disputed technical matters remains to be determined and was so accepted by the officers of the State Mining Bureau.

CHAPTER 718.

An act establishing and creating a department of the state mining bureau for the protection of the natural resources of petroleum and gas from waste and destruction through improper operations in production; providing for the appointment of a state oil and gas supervisor; prescribing his duties and powers; fixing his compensation; providing for the appointment of deputies and employees; providing for their duties and compensation; providing for the inspection of petroleum and gas wells; requiring all persons operating petroleum and gas wells to make certain reports; providing procedure for arbitration of departmental rulings; creating a fund for the purposes of the act; providing for assessment of charges to be paid by operators and providing for the collection thereof; and making an appropriation for the purposes of this act.

[Approved June 10, 1915. Amended 1917. Chapter 759.]

The people of the state of California do enact as follows:

Establishment of department. Appointment of supervisor.

SECTION 1. A separate department of the state mining bureau is hereby established and created to be known as the department of petroleum and gas. Such department shall be under the general jurisdiction of the state mineralogist. He shall appoint a supervisor who shall be a competent engineer or geologist experienced in the development and production of petroleum and who shall be designated the "state oil and gas supervisor," and whose term of office shall be four years from and after the date of his appointment.

Appointment of assistants. Compensation.

SEC. 2. For his services in the general supervision of said department, the state mineralogist shall receive as compensation one thousand four hundred dollars annually which shall be in addition to his compensation fixed in section two of the act of June 16, 1913, relating to the state mining bureau. The secretary of the state mining bureau shall receive for his services in connection with the department of petroleum and gas, a sum not to exceed six hundred dollars annually, which sum shall be in addition to his compensation paid from the funds of the state mining bureau.

The supervisor shall receive an annual salary of six thousand dollars, and shall be allowed his necessary traveling expenses. The state mineralogist may, at the request of the state oil and gas supervisor, and subject to the civil service laws of the state, appoint one chief clerk at a salary of not to exceed one thousand eight hundred dollars annually; twelve office assistants or stenographers each at a salary not to exceed one thousand two hundred dollars annually; four geological draughtsmen each at a salary not to exceed one thousand five hundred dollars annually; four petroleum engineers each at a salary not to exceed two thousand four hundred dollars annually; twelve inspectors each at a salary not to exceed one thousand eight hundred dollars annually.

The additional salary herein authorized to be paid to the state mineralogist and the secretary of the state mining bureau and the salaries of the supervisor and of the deputies, clerks, stenographers, assistants and other employees shall be paid out of the funds hereinafter provided for at the times and in the manner that salaries of other state officers and employees are paid.

Duties of supervisor.

SEC. 3. It shall be the duty of the state oil and gas supervisor so to supervise the drilling, operation and maintenance and abandonment of petroleum or gas wells in the State of California, as to prevent, as far as possible, damage to undergraund petroleum and gas deposits from infiltrating water and other causes and loss of petroleum and natural gas.

Appointment of deputies and attorney.

SEC. 4. It shall be the duty of the state oil and gas supervisor to appoint one chief deputy and five field deputies, one for each of the districts hereinafter provided for and prescribe their duties and fix their compensation, which shall not exceed four thousand dollars per annum for the chief deputy and not to exceed three thousand six hundred dollars per annum for each field deputy. Such deputies shall serve during the pleasure of the supervisor. He shall also employ an attorney at a compensation not exceeding three thousand dollars per year, payable out of said fund, who shall also be attorney for each district board of commissioners; such commissioners may allow additional compensation to such attorney in actual litigation. The supervisor, the deputies and the attorney shall not be subject to the civil service act.

Duties of deputies.

SEC. 5. Each deputy appointed by the supervisor shall be a competent engineer or geologist, experienced in the development and production of petroleum. At the time said deputy is appointed, notice of such appointment shall be transmitted in writing to the board of commissioners of the district for which said deputy is appointed. Said notice shall be given either personally or by mailing a notice of said appointment to the post-office address of each commissioner. No appointment shall be final until a period of ten days shall have elapsed from the mailing of said notice to said commissioners. In the event the majority of the commissioners notify said oil and gas supervisor in writing before the expiration of ten days from the date of said notice that the appointment of said field deputy is disapproved by them, then and in that event said field deputy shall not be appointed but said oil and gas supervisor must appoint some other individual as in this section provided. Each field deputy shall maintain an office in the district for which he is appointed, convenient of access to the petroleum and gas operators therein. The office shall be open and the deputy shall be present at certain specified times which shall be posted at such office.

SEC. 6. It shall be the duty of each deputy, to collect all necessary information regarding the oil wells in the district, with a view to determining the presence and source of water in the oil sand, and to make all maps and other accessories necessary to determine the presence and source of water in the oil sands. This work shall be done with the view to advising the operators as to the best means of protecting the oil and gas sands, and with a view to aiding the supervisor in ordering tests or repair work at wells. All such data shall be kept on file in the office of the deputy oil and gas supervisor of the respective district.

Records and their use.

SEC. 7. The records of any and all operators, when filed with the deputy supervisor as hereinafter provided, shall be open to inspection to those authorized in writing by such operators, to the state officers, and to the board of commissioners hereinafter provided for. Such records shall in no case other than those hereinafter and in this section provided, be available as evidence in court proceedings and no officer or employee or member of any board of commissioners shall be allowed to give testimony as to the contents of said records, except at such court proceedings as are hereinafter provided for in the review of the decision of the state oil and gas supervisor, or a board of commissioners, or in any proceedings initiated for the enforcement of an order of the supervisor, or any proceeding initiated for the enforcement of a lien created by this act, or any proceeding for the collection of the assessment levied under and pursuant to the provisions of this act or in criminal proceedings arising out of such records, or the statements upon which they are based.

Orders by supervisor. Agents of operators.

SEC. 8. It shall be the duty of the supervisor to order such tests or remedial work as in his judgment are necessary to protect the petroleum and gas deposits from damage by underground water, to the best interests of the neighboring property owners, and the public at large.

The order shall be in written form, signed by the supervisor, and shall be served upon the owner of the well, or the local agent appointed by such owner, either personally or by mailing a copy of said order to the post-office address given at the time the local agent is designated, or if no such local agent has been designated, by mailing a copy of said order to the last known post-office address of said owner, or if the owner be unknown by posting a copy of said order in a conspicuous place upon the property, and publishing the same in some newspaper of general circulation throughout the county in which said well is located, once a week for two successive weeks.

Said order shall specify the condition sought to be remedied and the work necessary to protect such deposits from damage from underground waters. For this purpose each operator or owner shall designate an agent, giving his post-office address, who resides within the county where the well or wells are located, upon whom all orders and notices provided for in this act may be served.

Rejection of supervisor's orders, and appeal.

SEC. 9. The well owner or his local agent may within ten days from the date of service of any order from the supervisor, file with the supervisor or his deputy in the district where the property is located, a statement that the supervisor's order is not acceptable and that appeal from said order is taken to the board of commissioners. Such appeal shall operate as a stay of any order issued under or pursuant to the provisions of this act.

Districts, commissioners, election, recall.

SEC. 10. For the purposes of this act the state shall be divided into five districts, as follows:

District No. 1, including the counties of Los Angeles, Riverside, Orange, San Diego, Imperial and San Bernardino.

District No. 2, the county of Ventura.

District No. 3, including the counties of Santa Barbara, San Luis Obispo, Monterey, Santa Cruz, San Benito, Santa Clara, Contra Costa, San Mateo, Alameda and San Francisco.

District No. 4, including the counties of Tulare, Inyo and Kern.

District No. 5, including the counties of Fresno, Madera, Kings, Mono, Mariposa, Merced and all other counties in California not included in any of said other districts.

There shall be elected at the times and in the manner hereinafter provided, district oil and gas commissioners for each such district, as follows:

For district number one, five; for district number two, five; for district number three, five; for district number four, seven; for district number five, five.

Said district oil and gas commissioners shall be elected by vote of the companies, individuals, copartnerships or associations, who shall have been assessed, and whose names shall appear on the last record of assessments (next preceding such election) for and on account of the fund in this act provided to be raised, within said districts respectively, said vote to be taken at a meeting to be held in each of said districts respectively, and on the third Monday in September of each year, such place and the time and details of such meeting to be fixed by the state oil and gas supervisor, and of which meeting at least two weeks previous notice shall have been given by letter addressed to each of said persons, corporations, copartnerships and associations, entitled to vote as aforesaid, at his or its post-office address or principal place of business.

At said meeting each of those entitled to vote as herein provided may be represented by one person holding the written authority of such voter to act for him at such meeting.

At said meeting each voter shall be entitled to one vote for each member of the board of district oil and gas commissioners who are required to be selected for such district. In addition thereto, in each district in which five commissioners are to be elected, each voter shall be entitled, for each one hundred dollars, or fraction thereof, which said voter shall have paid in accordance with his last assessment hereunder, to cast one vote for the two commissioners who are elected for three years; and in each district in which seven commissioners are to be elected, each voter shall be entitled, for each one hundred dollars, or fraction thereof, which said voter shall have paid in accordance with his last assessment hereunder, to cast one vote for the three commissioners who are elected for three years. In all subsequent elections the qualification of voters in the election of a commissioner shall be the same as in the election of the commissioner whose successor in office is being elected.

Said meeting shall select by ballot, by a majority vote of the votes represented, the number of persons as hereinbefore specified to act as district oil and gas commissioners for such district.

In any district entitled to seven commissioners, two shall be chosen for a term of one year, two for two years and three for three years. In any district entitled to five commissioners, one shall be chosen for a term of one year, two for two years and two for three years.

The chairman and secretary of the meeting shall issue a written certificate to the state oil and gas supervisor, setting forth the result of such election, and the name and address of each of the persons elected at said meeting as the district oil and gas commissioners for said district and the term for which each has been elected. No person shall be eligible as a district oil and gas commissioner who is not a resident of the district for which he is elected, nor shall any person be eligible for such position who is not actually engaged in the business of oil or gas development or production, within the district.

Upon receipt of the certficate so made by the chairman and secretary of any such meeting, the state oil and gas supervisor shall issue a certificate of election to the respective persons in said certificate named as the district oil and gas commissioners for said district, and for the periods of one, two or three years from and after the first Monday in October, 1917, as shall be shown in such certificate, and until their respective successors shall have been elected.

Within thirty days after their appointment by the state oil and gas supervisor, the district oil and gas commissioners for each district shall meet at a time and place within the district to be designated by the state oil and gas supervisor, and shall thereupon select one of the number as chairman.

The deputy supervisor of the district shall be ex officio secretary of said board, and shall keep a record of its proceedings, and his office shall be the office of the commissioners.

Said commissioners shall serve without compensation, except their necessary traveling expenses. The traveling expenses of said commissioners and all actual expenses incurred by or under order of said commissioners in the hearing and determination and carrying out of orders appealed to them, shall be certified to said state supervisor, and when audited by him and by the state board of control shall be paid from said fund.

On the third Tuesday in September of each year at an hour and places in said respective districts to be fixed by the state oil and gas supervisor, and of which notices shall have been given as hereinbefore specified, the successor of each of the district oil and gas commissioners whose term of appointment shall expire that year, shall be elected and qualified in the manner and subject to the provisions hereinbefore set forth, and the term of each shall be for a period of three years from and after the first Monday in October next succeeding.

All, either or any of the district oil and gas commissioners elected in any district may be recalled by the votes of a majority of the qualified votes of the district entitled to vote as to such commissioners respectively. In case there shall be filed in the office of the state oil and gas supervisor, a written petition, signed by not less than forty per cent of those entitled to vote as to the election of any commissioner or commissioners, asking the recall of such commissioner or commissioners, said state oil and gas supervisor shall, within ten days thereafter, order and give notice of, a special election in such district to fill the office or offices of the commissioner or commissioners named in said petition for recall; and shall cause notice to be given of said election in the manner, and for the time required for regular election, and said notice shall fix the time and place of such election.

At such election, the commissioner or commissioners named in such petition for recall shall be voted upon as though candidates for election for the unexpired portion of the term for which they, respectively, were originally elected, and any other candidate or candidates may, at the same time, be voted upon. It shall require a majority of all the qualified votes entitled to vote for such commissioners, respectively, to constitute an election. In case less than a majority of all qualified votes shall be cast for any candidate, said recall shall be deemed to have failed as to the commissioner concerning whose office such vote was taken; and in case such commissioner himself shall receive a majority of the votes, said recall shall be deemed to have failed, and in either of such cases, such commissioner shall continue to serve until the expiration of his term as though no such special election had been held. But in case any person other than such commissioner shall receive a majority of the votes for such unexpired term, then such recall shall become effective and the office of the commissioner so recalled shall be vacant and upon written certificate of such election being filed with the state oil and gas supervisor, the person so chosen and elected for such unexpired term shall become the successor of the commissioner so recalled, and a certificate of his election for such unexpired term shall be issued and transmitted to him by the state oil and gas supervisor. And like proceedings shall be had in case more than one commissioner shall be included in said petition for recall.

In all recall elections, qualifications for voters and the numbers of votes which they will be entitled to cast shall be the same as they respectively were in the election of the commissioner as to whom such recall election is being held.

In case of vacancy caused by the death, resignation or removal from district or ceasing to be engaged in the business of development or production of oil or gas in the district as to the office of any commissioner, such vacancy shall be filled until the next annual election by the state oil and gas supervisor, who shall appoint to fill such vacancy an eligible person, nominated in writing by the remaining commissioners of such district.

Upon any subject in which any commissioner is personally interested, or upon which any corporation, copartnership, association or individual by whom he is employed is directly interested as a party, such commissioner shall not be entitled to sit or vote.

The board of commissioners shall be entitled to call upon the supervisor for advice, and written report upon any matter referred to the board of commissioners, and the supervisor shall be entitled to call meetings of the commissioners at the office of the field supervisor, upon five days' written notice, to obtain their written advice upon any matters relating to his work within their district.

Complaint, investigation and order.

SEC. 11. Upon receipt by the supervisor or deputy supervisor of a written complaint specifically setting forth the condition complained against, signed by a person, firm, corporation or association owning land or operating wells within a radius of one mile of any well or group of wells complained against, or upon the written complaint specifically setting forth the condition complained against, signed by any one of the board of commissioners for the district in which said well or group of wells complained against is situated, the supervisor must make an investigation of said well or wells and render a written report stating the work required to repair the damage complained of, or stating that no work is required. A copy of said order must be delivered to the complainant, or if more than one, each of said complainants, and if the supervisor order the damage repaired, a copy of such order shall be delivered to each of the owners, operators or agents having in charge the well or wells upon which the work is to be done. Said order shall contain a statement of the conditions sought to be remedied or repaired and a statement of the work required by the supervisor to repair such condition. Service of such copies shall be made by mailing to such persons at the post-office address given.

Testimony.

SEC. 12. In any proceeding before the board of commissioners as herein provided, or in any other proceeding or proceedings instituted by the supervisor for the purpose of enforcing or carrying out the provisions of this act, or for the purpose of holding an investigation to ascertain the condition of any well or wells complained of, or which in the opinion of the supervisor may reasonably be presumed to be improperly drilled, operated, maintained or conducted, the supervisor and the chairman of the board of commissioners shall have the power to administer oaths and may apply to a judge of the superior court of the State of California, in and for the county in which said proceeding or investigation is pending, for a subpœna for witnesses to attend at said proceeding or investigation. Upon said application of said supervisor or said chairman of said board of commissioners, said judge of said superior court must issue a subpœna directing said witness to attend said proceeding or investigation; *provided, however,* that no person shall be required to attend upon such proceeding, either with or without such books, papers, documents or accounts unless residing within the same county or within thirty miles of the place of attendance. But the supervisor or the chairman of the board of commissioners may in such case cause the depositions of witnesses residing within or without the state to be taken in the manner prescribed by law for like depositions in civil actions in superior courts of this state, and to that end may, upon application to a judge of the superior court of the county within which said proceeding or investigation is pending, obtain a subpœna compelling the attendance of witnesses and the production of books, papers and documents at such places as he may designate within the limits hereinbefore prescribed. Witnesses shall be entitled to receive the fees and mileage fixed by law in civil causes, payable from the fund hereinafter created. In case of failure or neglect on the part of any person to comply with any order of the supervisor as hereinbefore provided, or any subpœna, or upon the refusal of any witness to testify to any matter regarding which he may lawfully be interrogated, or upon refusal or neglect to appear and attend at any proceeding or hearing on the day specified, after having received a written notice of not less than ten days prior to such proceeding or hearing, or upon his failure, refusal or neglect to produce books, papers or documents as demanded in said order or subpœna upon such day, such failure, refusal or neglect shall constitute a misdemeanor and each day's further failure, refusal or neglect shall be and be deemed to be a separate and distinct offense, and it is hereby made the duty of the district attorney of the county in which said proceeding, hearing or investigation is to be held, to prosecute all persons guilty of violating this section by continuous prosecution until such person appears or attends or produces such books, papers or documents or complies with said subpœna or order of the supervisor or chairman of the board of commissioners.

Final decision, and order by commissioners.

SEC. 13. Within ten days after hearing the evidence, the board of commissioners must make a written decision with respect to the order appealed from and in case the same is affirmed or modified, shall retain jurisdiction thereof until such time as the work ordered to be done by such order shall be finally completed. This written decision shall be served upon the owner or his agent and shall supersede the previous order of the supervisor. In case no written decision be made by said board of commissioners within thirty days after the date of notice by the supervisor as provided in section ten hereof, the order of the supervisor shall be effective and subject only to review by writ of certiorari from the superior court as provided in section fourteen hereof.

Repair of wells by supervisor. Review by superior court.

SEC. 14. On or before thirty days after the date of serving an order of the supervisor, provided for in section eight hereof, or in case of appeal to the board of commissioners, on or before thirty days after date of serving the decision of the board, as provided in sections twelve and thirteen hereof, or in the event review be taken of the order of the board of commissioners within ten days after affirmance of such order, the owner shall commence in good faith the work ordered and continue until completion. If the work has not been so commenced and continued to completion, the supervisor shall appoint agents as he deems necessary who shall enter the premises and perform the work. Accurate account of such expenditures shall be kept and the amount paid from the fund hereinafter created upon the warrant of the state controller. Any amount so expended shall constitute a lien against the property upon which the work is done. The decision of the board of commissioners in such case may be reviewed by writ of certiorari from the superior court of the county in which the district is situated, if taken within ten days after the service of the order upon said owner, operator or agent of said owner or operator as herein provided; or within ten days after decision by the board of commissioners upon petitions by the supervisor. Such writ shall be made returnable not later than ten days after the issuance thereof and shall direct the district board of oil and gas commissioners to certify their record in the cause to such court. On the return day the cause shall be heard by the court unless for good cause the same be continued, but no continuance shall be permitted for a longer period than thirty days. No new or additional evidence shall be introduced in the court before the cause shall be heard upon the record of the district board of oil and gas commissioners. The review shall not be extended further than to determine whether or not

1. The commission acted without or in excess of its jurisdiction.
2. The order, decision or award was procured by fraud.
3. The order, decision, rule or regulation is unreasonable.
4. The order, decision, regulation or award is clearly unsupported by the evidence.

If no review be taken within ten days, or if taken in case the decision of the board is affirmed, the lien upon the property shall be enforced in the same manner as the other liens on real property are enforced, and shall first be enforced against the owner of the well, against the operator and against the personal property and fixtures used in the construction or operation thereof, and then if there be any deficiency against the land upon which the work is done, upon the request of the supervisor, the state controller must, in the manner provided in section forty-four of this act, bring an action for the enforcement of said lien.

Casing. Water shut off.

SEC. 15. It shall be the duty of the owner of any well now drilled, or that may be drilled in the State of California, on lands producing or reasonably presumed to contain petroleum or gas, to properly case such well or wells with metal casing, in accordance with methods approved by the supervisor, and to use every effort and endeavor in accordance with the most approved methods to effectually shut off all water overlying or underlying the oil or gas-bearing strata, and to effectually prevent any water from penetrating such oil or gas-bearing strata.

Whenever it appears to the supervisor that any water is penetrating oil or gas-bearing strata, he may order a test of water shut-off and designate a day upon which the same shall be held. Said order shall be in written form and served upon the owner of said well at least ten days prior to the day designated in said order as the day upon which said shut-off test shall be held. Upon the receipt of such order it shall be the duty of the owner to hold said test in the manner and at the time prescribed in said order.

Abandonment of well.

SEC. 16. It shall be the duty of the owner of any well referred to in this act, before abandoning the same, or before removing the rig, derrick or other operating structure therefrom, or removing any portion of the casing therefrom, to use every effort and endeavor in accordance with methods approved by the supervisor, to shut off and exclude all water from entering oil-bearing strata encountered in the well. Before any well is abandoned the owner shall give written notice to the supervisor, or his local deputy, of his intention to abandon such well and of his intention to remove the derrick or any portion of the casing from such well and the date upon which such work of abandonment or removal shall begin. The notice shall be given to the supervisor, or his local deputy, at least five days before such proposed abandonment or removal. The owner shall furnish the supervisor, or his deputy with such information as he may request showing the condition of the well and proposed method of abandonment or removal. The supervisor, or his deputy, shall before the proposed date of abandonment or removal, furnish the owner with a written order of approval of his proposal or a written order stating what work will be necessary before approval, to abandon or remove will be given. If the supervisor shall fail within the specified time to give the owner a written order such failure shall be considered as an approval of the owner's proposal to abandon the well, or to remove the rig or casing therefrom.

Commencement of drilling.

SEC. 17. The owner or operator of any well referred to in this act shall, before commencing the work of drilling an oil or gas well, file with the supervisor, or his local deputy, a written notice of intention to commence drilling. Such notice shall also contain the following information: (1) Statement of location and elevation above sea level of the floor of the proposed derrick and drill rig; (2) the number or other designation by which such well shall be known, which number or designation shall not be changed after filing the notice provided for in this section, without the written consent of the supervisor being obtained therefor; (3) the owner's or operator's estimate of the depth of the point at which water will be shut off, together with the method by which such shut-off is intended to be made and the size and weight of casing to be used; (4) the owner's or operator's estimate of the depth at which oil or gas producing sand or formation will be encountered.

After the completion of any well the provisions of this section shall also apply, as far as may be, to the deepening or redrilling of any well, or any operation involving the plugging of any well or any operations permanently altering in any manner the casing of any well; *and provided, further*, that the number or designation by which any well heretofore drilled has been known, shall not be changed without first obtaining a written consent of the supervisor.

Log of well. Prospect well.

SEC. 18. It shall be the duty of the owner or operator of any well referred to in this act, to keep a careful and accurate log of the drilling of such well, such log to show the character and depth of the formation passed through or encountered in the drilling of such well, and particularly to show the location and depth of the water-bearing strata, together with the character of the water encountered from time to time (so far as ascertained) and to show at what point such water was shut off, if at all, and if not, to so state in such log, and show completely the amounts, kinds and size of casing used, and show the depth at which oil-bearing strata are encountered, the depth and character of same, and whether all water overlying and underlying such oil-bearing strata was successfully and permanently shut off so as to prevent the percolation or penetration into such oil-bearing strata; such log shall be kept in the local office of the owner or operator, and together with the tour reports of said owner or operator, shall be subject, during business hours, to the inspection of the supervisor, or any of his deputies, or any of the commissioners of the district, except in the case of a prospect well as hereinafter defined. Upon the completion of any well, or upon the suspension of operations upon any well, for a period of six months if it be a prospect well, or for thirty days, if it be in proven territory, a copy of said log in duplicate, and in such form as the supervisor may direct, shall be filed within ten days after such completion, or after the expiration of said thirty-day period, with the field supervisor, and a like copy shall be filed upon the completion of any additional work in the deepening of any such well.

The state oil and gas supervisor shall determine and designate what wells are prospect wells within the meaning of this act and no reports shall be required from such prospect wells until six months after the completion thereof.

The owner or operator of any well drilled previous to the enactment of this act shall furnish to the supervisor or his deputy a complete and correct log in duplicate and in such form as the supervisor may direct, or his deputy, of such well, so far as may be possible, together with a statement of the present condition of said well.

Test of shut-off.

SEC. 19. It shall be the duty of the owner or operator of any well referred to in this act to notify the deputy supervisor of the time at which the owner or operator shall test the shut-off of water in any such well. Such notice shall be given at least five days before such test. The deputy supervisor or an inspector designated by the supervisor shall be present at such test and shall render a report in writing of the result thereof to the supervisor, a duplicate of which shall be delivered to the owner. If any test shall be unsatisfactory to the supervisor he shall so notify the owner or operator in said report and shall within five days after the completion of such test, order additional tests of such work as he deems necessary to properly shut off the water in such well and in such order shall designate a day upon which the owner or operator shall again test the shut-off of water in any such well, which day may, upon the application of the owner, be changed from time to time in the discretion of the deputy supervisor.

Production reports.

SEC. 20. It shall be the duty of every person, association or corporation producing oil in the State of California, to file with the supervisor, at his request but not oftener than once in each month, a statement showing amount of oil produced during the period indicated from each well, together with its gravity and the amount of water produced from each well, estimated in accordance with methods approved by the supervisor, and the number of days during which fluid was produced from each well, the number of wells drilling, producing, idle or abandoned, owned or operated by said person, association or corporation; *provided*, that, upon request and satisfactory showing a longer interval may be fixed by the state oil and gas supervisor as to such reports in the case of any specific owner or operator.

This information shall be in such form as the supervisor may designate.

Penalty.

SEC. 21. Any owner or operator of a well referred to in this act, or employee thereof, who refuses to permit the supervisor, or his deputy, to inspect the same, or who wilfully hinders or delays the enforcement of this act, and every person, firm, or corporation, who violates any provision of this act, is guilty of a misdemeanor and shall be punishable by a fine of not less than one hundred dollars, or by imprisonment in the county jail for not less than thirty days, or by both such fine and imprisonment.

Police power of the state.

SEC. 21*a*. The charges hereinafter provided for are directed to be levied by the State of California as necessary in the exercise of its police power and to provide a means by which to supervise and protect deposits of petroleum and gas within the State of California, in which deposits the people of the State of California are hereby declared to have a primary and supreme interest.

Charges assessed.

SEC. 22. Charges levied, assessed and collected as hereinafter provided upon the properties of every person, firm, corporation or association operating any well or wells for the production of petroleum in this state, or operating any well or wells for the production of natural gas in this state which gas wells are situate on lands situate within two miles, as near as may be, of any petroleum or gas well the production of which is chargeable under this act, shall be used exclusively for the support and maintenance of the department of petroleum and gas hereinbefore created, and shall be assessed and levied by the state mineralogist, and collected in the manner hereinafter provided.

Charges on oil.

SEC. 23. Every person, firm, corporation or association operating any petroleum well or wells in this state shall annually pay a charge to the state treasurer at a uniform rate per barrel of petroleum produced for the preceding calendar year at the time and in the manner hereinafter provided, based upon a verified report as herein provided.

Charges on gas.

SEC. 24. Every person, firm, corporation or association operating any gas well or wells in this state shall annually pay a charge to the state treasurer based upon the amount of gas sold in the preceding calendar year, at a fixed rate per thousand cubic feet, at the times and in the manner hereinafter provided, based upon a verified report as herein provided.

Charges on land.

SEC. 25. Every person, firm, corporation or association owning any oil land, as determined by the supervisor, shall annually pay a charge to the state treasurer at the time and in the manner hereinafter provided, which charge shall be a uniform rate per acre. Said charge shall be based upon a verified report as provided herein; *provided, however*, that such lands so assessed shall not be called upon to pay more than one-tenth of the total charges or moneys proposed to be assessed, levied and collected under the provisions of this act for any one year.

SEC. 26. The charges assessed, levied and to be collected under the provisions of this act shall be in addition to any and all charges, taxes, assessments or licenses of any kind or nature paid by or upon the properties assessed hereunder.

Annual financial estimate.

SEC. 27. The state mineralogist shall annually, on or before the first Monday in March, acting in conjunction with the state board of control, make an estimate of the amount of moneys which shall be required to carry out the provisions of this act.

At the time of making such estimate, the state mineralogist shall report to the state board of control the amount of money in the petroleum and gas fund on the day such estimate is made, less the amount of money necessary for the support of the department of petroleum and gas for the remainder of the fiscal year, and the amount of such estimate shall in no event exceed the difference between the amount thus determined as remaining in the petroleum and gas fund at the end of the fiscal year and the sum of one hundred fifty thousand dollars.

Annual reports by owners.

SEC. 28. The state mineralogist shall prescribe the form and contents of all reports for making the charge or other purposes to carry out the intent and provision of this act, which form shall be mailed in duplicate to the person, firm, corporation or association owning property or assessed under the provisions of this act.

SEC. 29. Every person, firm, corporation or association chargeable under the provisions of this act, shall within ten days after the first Monday in March of each year, report to and file with the state mineralogist, a report in such form as said officer may prescribe, giving any and all items of information as may be demanded by said report, and necessary to carry out the provisions of this act, which report shall be verified by such person or officer as the state mineralogist may designate.

SEC. 30. If any person, firm, corporation or association chargeable under the provisions of this act shall fail or refuse to furnish the state mineralogist within the time prescribed in this act the verified report provided for in this act, the state mineralogist must note such failure or refusal in the record of assessments hereinafter in this act provided for, and must make an estimate of the petroleum or gas production, or landed area to be assessed of any such person, firm, corporation or association and must assess the same at the amount thus estimated and compute the charge thereon, which assessment and charge shall be the assessment and charge for such year. And if in the succeeding year any such person, firm, corporation or association shall again fail and refuse to furnish the verified report required by this act, the state mineralogist shall make an estimate as aforesaid, which estimate shall not be less than twice the amount of the estimate made by him for the previous year, and shall note such failure or refusal as above provided, and the said estimate so made shall be the assessment or charge for said year. In case of each succeeding consecutive failure or refusal the said state mineralogist shall follow the same procedure until a true statement or report shall be furnished.

Penalty.

SEC. 31. Any person, firm, corporation or association failing or refusing to make or furnish any report which may be required pursuant to the provisions of this act, or who wilfully renders a false or fraudulent report, shall be guilty of a misdemeanor and subject to a fine of not less than three hundred dollars, nor more than one thousand dollars, or by imprisonment in the county jail not exceeding six months, or both such fine and imprisonment for each such offense.

Extension date filing reports.

SEC. 32. The state mineralogist may, for good cause shown, by order entered upon his minutes, extend for not exceeding thirty days, the time fixed in this act for filing any report herein provided for.

Rate of assessment.

SEC. 33. On or before the third Monday before the first Monday in July of each year, the state mineralogist shall determine the rate or rates which shall produce the sums necessary to be raised as provided in section twenty-seven of this act. Within the same time the said state mineralogist shall extend into the proper column of the record of assessments hereinafter provided for, the amount of charges due from each person, firm, corporation or association.

SEC. 34. Between the first Monday in March and the third Monday before the first Monday in July in each year, the state mineralogist must assess and levy the charges as and in the manner provided for in this act. The assessments must be made to the person, firm, corporation or association owning or operating the property subject to assessment hereunder on the first Monday in March. If the name of the owner is unknown to the state mineralogist, such assessment must be made to unknown owners. Clerical errors occurring or appearing in the name of any person, firm, corporation or association whose property is properly assessed and charged, or in the making, or extension of any assessment or charge upon the records, which do not affect the substantial rights of the payer, shall not invalidate the assessment or charge.

Equalization.

SEC. 35. The state mineralogist and the chairman of the state board of control and the chairman of the state board of equalization shall constitute a board of review, correction and equalization, and shall have all the powers and perform such duties as usually devolve upon a county board of equalization under the provisions of section three thousand six hundred seventy-two of the Political Code. The state mineralogist shall act as secretary of said board, and shall keep an accurate minute of the proceedings thereof. Said board of review, correction and equalization shall meet at the state capitol on the third Monday before the first Monday in July of each year, and remain in session from day to day until the first Monday in July for the purpose of carrying out the provisions of this section.

Publication of assessment notice.

SEC. 36. On the third Monday before the first Monday in July of each year the state mineralogist shall cause to be published a notice, one or more times, in a daily, or weekly, or semiweekly newspaper of general circulation published in the counties of Fresno, Kern, Los Angeles, Orange, Ventura and Santa Barbara, and such other counties as may contain lands or produce oil or gas charged under and pursuant to the terms and provisions of this act, if one be published therein, otherwise in a newspaper of general circulation published in the county nearest to such county designated herein in which no such paper is published, that the assessment of property and levy of charges under and in pursuance of this act has been completed and that the records of assessments containing the charges due will be delivered to the state controller on the first Monday in July, and that if any person, firm, corporation or association is dissatisfied with the assessment made or charge fixed by the state mineralogist, he or it may, at any time before said first Monday in July, apply to said board of review, correction and equalization to have the same corrected in any particular. The said board shall have the power at any time before said first Monday in July to correct the record of assessments and may increase or decrease any assessment or charge therein if in its judgment the evidence presented or obtained warrants such action. Costs of such publication in any county shall be paid from the petroleum and gas fund; *provided, however,* that the omission to publish said notice as hereinbefore and in this section provided, shall not affect the validity of any assessment levied under or pursuant to the provisions of this act.

Record of assessment.

SEC. 37. The state mineralogist must prepare each year a book in one or more volumes, to be called the "Record of assessments and charges for the petroleum and gas fund," in which must be entered, either in writing or printing, or both writing and printing, each assessment and levy or charge made by him upon the property provided to be assessed and charged under this act, describing the property assessed, and such assessments may be classified and entered in such separate parts of said record as said state mineralogist shall prescribe.

SEC. 38. On the first Monday in July the state mineralogist must deliver to the state controller the record of assessments and charges for the petroleum and gas fund, certified to by said state mineralogist, which certificate shall be substantially as follows: "I, ---------------, state mineralogist, do hereby certify that between the first Monday in March and the first Monday in July, 19---, I made diligent inquiry and examination to ascertain all property and persons, firms, corporations and associations subject to assessment for the purpose of the petroleum and gas fund as required by the provisions of the act of legislature approved June 10, 1915, providing for the assessment and collection of charges for oil protection; that I have faithfully complied with all the duties imposed upon me by law; that I have not imposed any unjust or double assessment through malice or ill will, or otherwise; nor allowed any person, firm, corporation or association or property to escape a just assessment or charge through favor or regard, or otherwise." But the failure to subscribe such certificate to such record of assessments and charges for oil protection, or any certificate, shall not in any manner affect the validity of any assessment or charge.

Payment of charges.

SEC. 39. The charges levied and assessed under the provisions of this act shall be due and payable on the first Monday in July in each year, and one-half thereof shall be delinquent on the sixth Monday after the first Monday in July at six o'clock p.m. and unless paid prior thereto, fifteen per cent shall be added to the amount thereof, and unless paid prior to the first Monday in February next thereafter at six o'clock p.m., an additional five per cent shall be added to the amount thereof, and the unpaid portion, or the remaining one-half of said charges shall become delinquent on the first Monday in February next succeeding the day upon which they become due and payable, at six o'clock p.m.; and if not paid prior thereto five per cent shall be added to the amount thereof.

Publication of notice of payments due.

SEC. 40. Within ten days after the receipt of the record of assessments and charges for oil protection, the state controller must begin the publication of a notice to appear daily for five days, in one daily newspaper of general circulation published in each of the counties of Fresno, Kern, Los Angeles, Orange, Ventura and Santa Barbara, and such other counties as may contain lands or produce oil or gas charged under or pursuant to the terms and provisions of this act, if one be published therein, otherwise for at least two times in a weekly or semiweekly paper of general circulation published therein, or if there be neither a daily nor weekly nor semiweekly paper of general circulation published in any one of such counties, then the publication of the notice for such county shall be made in a similar manner in a newspaper of general circulation published in the county nearest such county, specifying: (1) That he has received from the state mineralogist the record of assessments and charges for oil protection; (2) that the charges therein assessed and levied are due and payable on the first Monday in July and that one-half thereof will be delinquent on the sixth Monday after the first Monday in July at six o'clock p.m., and that unless paid to the state treasurer at the capital prior thereto, fifteen per cent will be added to the amount thereof, and unless paid prior to the first Monday in February next thereafter at six o'clock p.m., and additional five per cent will be added to the amount thereof; and that the remaining one-half of said charges will become delinquent on the first Monday in February next succeeding the day upon which they become due and payable, at six o'clock p.m. and if not paid to the state treasurer at the capital prior thereto, five per cent will be added to the amount thereof. Costs of such publication in any county shall be paid from the petroleum and gas fund.

Charges become lien.

SEC. 41. The assessments and charges levied under the provisions of this act shall constitute a lien upon all the property of every kind and nature belonging to the persons, firms, corporations and associations assessed under the provisions hereof, which lien shall attach on the first Monday in March of each year. Such lien shall be enforced and said charges collected by an action by the state controller as provided in section forty-four of this act.

Charges payable to treasurer.

SEC. 42. All charges assessed and levied under the provisions of this act shall be paid to the state treasurer upon the order of the state controller. The controller must mark the date of payment of any charge on the record of assessments for the petroleum and gas fund and shall give a receipt for such payment in such form as the controller may prescribe. Errors appearing upon the face of any assessment on said record of assessments or over charges may be corrected by the controller by and with the consent of the state board of control, in such manner and at such time as said controller and said board shall agree upon.

Protest of charges.

SEC. 43. Any person, firm, corporation or association claiming and protesting as herein provided that the assessment made or charges assessed against him or it by the state mineralogist is void, in whole or in part, may bring an action against the state treasurer for the recovery of the whole or any part of such charges, penalties or costs paid on such assessment, upon the grounds stated in said protest, but no action may be brought later than the third Monday in February next following the day upon which the charges were due, nor unless such person, firm, corporation or association shall have filed with the state controller at the time of payment of such charges, a written protest stating whether the whole assessment or charge is claimed to be void, or if a part only, what part, and the grounds upon which such claim is founded, and when so paid under protest the payment shall in no case be regarded as voluntary.

Whenever, under the provisions of this section, an action is commenced against the state treasurer, a copy of the complaint and of the summons must be served upon the treasurer, or his deputy. At the time the treasurer demurs or answers, he may demand that the action be tried in the superior court of the county of Sacramento, which demand must be granted. The attorney employed by the state oil and gas supervisor must defend such action; *provided, however*, the said mineralogist may at the request of the said oil and gas supervisor employ additional counsel, the expense of which employment shall be paid from the petroleum and gas fund. The provisions of the Code of Civil Procedure relating to pleadings, proofs, trials and appeals are applicable to the proceedings herein provided for.

A failure to be in such action within the time herein specified shall be a bar against the recovery of such charges. In any such action the court shall have the power to render judgment for the plaintiff for any part or portion of the charge, penalties, or costs found to be void and so paid by plaintiff upon such assessment.

Delinquent charges.

SEC. 44. The state controller shall, on or before the thirtieth day of May next following the delinquency of any charge as provided in this act, bring an action in a court of competent jurisdiction, in the name of the people of the State of California, in the county in which the property assessed is situated, to collect any delinquent charges or assessments, together with any penalties or costs, which have not been paid in accordance with the provisions of this act and appearing delinquent upon the records of assessments and charges for the petroleum and gas fund in this action provided for.

The attorney for the state oil and gas supervisor shall commence and prosecute such action to final judgment and the provisions of the Code of Civil Procedure relating to service of summons, pleadings, proofs, trials and appeals are applicable to the proceedings herein provided for. The state mineralogist may employ additional counsel to assist the attorney for the state oil and gas supervisor, and the expense of such employment shall be paid from the petroleum and gas fund.

Payments of the penalties and charges, or amount of the judgment recovered in such action must be made to the state treasurer. In such actions the record of assessment and charges for oil protection, or a copy of so much thereof as is applicable in said action, duly certified by the controller showing unpaid charges against any person, firm, corporation or association assessed by the state mineralogist is prima facie evidence of the assessment upon the property, the delinquency, the amount of charges, penalties, and costs due and unpaid to the state, and that the person, firm, corporation or association is indebted to the people of the State of California in the amount of charges and penalties therein appearing unpaid and that all the forms of law in relation to the assessment of such charges have been complied with.

First assessment, March, 1916.

SEC. 45. The first assessment under the provisions of this act shall be as of the first Monday in March, nineteen hundred sixteen, and the reports of petroleum production and sales of gas herein provided to be assessed shall be reported for the calendar year ending December thirty-first, nineteen hundred fifteen. The lands herein provided to be assessed and charged shall be assessed to the owners thereof as of the first Monday in March, nineteen hundred sixteen.

Disposal of funds.

SEC. 46. All the moneys heretofore paid to the state treasurer under or pursuant to the provisions of this act and deposited to the credit of the oil protection fund, shall be withdrawn from said fund, which is hereby abolished, and deposited to the credit of the petroleum and gas fund which is hereby created. All of the moneys hereafter paid to the state treasurer under or pursuant to the provisions of this act shall be deposited to the credit of the petroleum and gas fund. All moneys in such fund shall be expended under the direction of the state mineralogist, drawn from such fund for the purpose of this act upon warrants drawn by the controller of the state, upon demands made by the state mineralogist, and audited by the state board of control. Of the moneys in said petroleum and gas fund, when such action has been authorized by the state board of control, the state mining bureau may withdraw, without at the time furnishing vouchers and itemized statements, a sum not to exceed five hundred dollars, said sum so drawn to be used as a revolving fund where cash advances are necessary. At the close of each fiscal year, or at any other time, upon demand of the board of control, the moneys so drawn shall be accounted for and substantiated by vouchers and itemized statements submitted to and audited by the board of control.

SEC. 47. All moneys received in repayment of repair work done under the order and direction of the supervisor as hereinbefore provided, shall be returned and credited to the petroleum and gas fund.

Annual report by supervisor.

SEC. 48. On or before the first day of October of each and every year the supervisor shall submit a report in writing to the state mineralogist showing the total number of barrels of petroleum produced in each county in the state during the previous calendar year, together with the total cost of said department for the previous fiscal year and the net amount remaining in the petroleum and gas fund available for the succeeding fiscal year's expense, also the total amount delinquent and uncollected from any assessments or charges levied under or pursuant to the provisions of this act. Such report shall also include such other information as the supervisor may deem advisable. The state mineralogist shall make public such statements promptly after receipt of the same from the supervisor for the benefit of all parties interested therein.

Recording of leases.

SEC. 49. The owner or operator of any lands or tenements subject to assessment under this act shall, within six months after this act goes into effect, file with the supervisor a certificate which shall contain the names of all the parties claiming an interest in or to said lands and full description of the property and the names of all parties in interest where such interest is held by lease, license or assignment.

Definitions.

SEC. 50. Whenever the term "supervisor" is used in this act it shall be taken to mean the "state oil and gas supervisor," the term "oil" shall include "petroleum," the term "petroleum" shall include "oil," the term "gas" shall mean natural gas coming from the earth, the term "operator" shall mean any person, firm or corporation drilling, maintaining, operating, pumping, or in control of a well in any territory which the supervisor determines to be oil or gas producing territory, the term "owner" shall include "operator" when any oil or gas well is operated or has been operated or is about to be operated by any person, firm or corporation other than the owner thereof, and the term "operator" shall include "owner" when any such well is or has been or is about to be operated by or under the direction of the owner, except that all the provisions of this act relating to assessments for the purposes of this act based upon the annual production of oil or petroleum or sale of gas, as set forth in sections twenty-two to forty-five, inclusive of this act, shall apply only to a person, firm or corporation operating an oil or petroleum or gas well, and shall not apply to the owner of such well if some person, firm or corporation, other than such owner, has been actually operating the well during the whole period for which such annual charge is made, but in the event that the actual operation of any such well changes hands during such period, the charge shall be apportioned upon the basis of the oil or petroleum or gas produced, and the lien provided for in section forty-one of this act shall be a lien against the property of each and all such operators.

Appropriation first year.

SEC. 51. There is hereby appropriated out of any moneys in the state treasury, not otherwise appropriated, the sum of twenty thousand dollars which said sum shall be immediately transferred by the state controller on the books of his office from the general fund to the "oil protection fund" created by section forty-six of this act.

The above mentioned fund shall be available for the uses of the state mineralogist for the maintenance of the department of petroleum and gas and for the necessary expenses of the controller in carrying out the provisions of this act. When the collections paid to the state treasurer, as herein provided, equal the sum of thirty thousand dollars then said sum of twenty thousand dollars shall be re-transferred from the oil protection fund to the general fund. The moneys received into the state treasury through the provisions of this act are hereby appropriated for the uses and purposes herein specified.

Constitutionality.

SEC. 52. If any section, subsection, sentence, clause or phrase of this act is for any reason held to be unconstitutional, such decision shall not affect the validity of the remaining portions of this act. The legislature hereby declares that it would have passed this act, and each section, subsection, sentence, clause, and phrase thereof, irrespective of the fact that any one or more other sections, subsections, sentences, clauses, or phrases be declared unconstitutional.

Incorporated cities.

SEC. 53. This act shall be liberally construed to meet its purposes and the supervisor shall have all powers which may be necessary to carry out the purposes of this act, but the provisions of this act shall not apply to any land or wells situated within the boundaries of an incorporated city where the drilling of oil wells is prohibited.

Repeal of previous law.

SEC. 54. That certain act entitled "An act to prevent injury to oil, gas or petroleum-bearing strata or formations by the penetration or infiltration of water therein," approved March 20, 1909, together with all acts amendatory thereof and supplemental thereto and all acts in conflict herewith are hereby repealed. Nothing herein shall be construed as affecting the provisions of the act of June 16, 1913, establishing a state mining bureau.

TO PREVENT WASTING OF NATURAL GAS.

An act prohibiting the unnecessary wasting of natural gas into the atmosphere; providing for the capping or otherwise closing of wells from which natural gas flows; and providing penalties for violating the provisions of this act.

[Approved March 25, 1911.]

The people of the state of California, represented in senate and assembly, do enact as follows:

SECTION 1. All persons, firms, corporations and associations are hereby prohibited from wilfully permitting any natural gas wastefully to escape into the atmosphere.

SEC. 2. All persons, firms, corporations or associations digging, drilling, excavating, constructing or owning or controlling any well from which natural gas flows shall upon the abandonment of such well, cap or otherwise close the mouth of or entrance to the same in such a manner as to prevent the unnecessary or wasteful escape into the atmosphere of such natural gas. And no person, firm, corporation or association owning or controlling land in which such well or wells are situated shall wilfully permit natural gas flowing from such well or wells, wastefully or unnecessarily to escape into the atmosphere.

SEC. 3. Any person, firm, corporation or association who shall wilfully violate any of the provisions of this act shall be deemed guilty of a misdemeanor, and upon conviction thereof shall be punished by a fine of not more than one thousand dollars or by imprisonment in the county jail for not more than one year, or by both such fine and imprisonment.

SEC. 4. For the purposes of this act each day during which natural gas shall be wilfully allowed wastefully or unnecessarily to escape into the atmosphere shall be deemed a separate and distinct violation of this act.

SEC. 5. All acts or parts of acts in conflict herewith are hereby repealed.

SEC. 6. This act shall take effect immediately.

OFFICE BUILDINGS.

Arrangements have been made for the erection of office buildings on leased land at the towns of Taft and Coalinga. The buildings will provide room for the assembling and displaying of peg models useful to all operators in the fields. Fireproof vaults will provide for the safekeeping of invaluable records of underground conditions.

SPECIAL REPORTS ON TECHNICAL AND MECHANICAL SUBJECTS.

It is aimed to make the annual report of the supervisor contain authoritative statements on subjects of interest to progressive oil operators. All members of our staff are encouraged to prepare articles on either mechanical or technical matters which have not previously been published. Such articles are edited by the supervisor, with the aid of the deputies, with a view to attaining correctness and avoiding useless statements. Similar articles by persons not regularly in the service of the department will be given space in the report under the same conditions.

METHODS AND REASONS FOR OIL WELL SHOOTING.

By M. J. KIRWAN, Deputy Supervisor.

Previous to the year 1910 oil wells in California were generally shot in the following manner:

A shell, or container, was made of ordinary galvanized, light sheet iron. Sticks of stock 60% dynamite, usually from ⅞″ to 1⅛″ in diameter by 8″ in length, were loaded into the shell and lowered into the well to the desired depth by the sand line. The charge of dynamite was detonated by use of a blasting cap, lighted with fuse. The length of the fuse was regulated so as to allow sufficient time to lower the shell to the desired shooting depth before detonation. The diameter of the shell was governed by the size of the casing through which it had to be run and the length of the shell by amount of dynamite used.

In some instances a piece of casing was used for a container of the dynamite. This kind of a container was lowered into the well to the desired depth by an attached string of tubing extending to the surface. The charge of dynamite exploded by dropping a squib shot through the tubing. Squib shots usually consist of a short piece of pipe about 1″ in diameter, containing one or two sticks of dynamite with cap and lighted fuse attached. The explosion of the squib shot detonated the main charge of dynamite previously lowered into the well.

The foregoing described methods of shooting wells are still used in some cases. The results obtained by employing such methods have, in many instances, been unsatisfactory and in some cases detrimental to the well on account of casing having been shot off at the wrong depth, as a result of premature explosion. There are cases in which workmen engaged in shooting have been killed or injured while using one of these methods, on account of accidental explosions at the surface.

The modern method of shooting oil wells is accomplished by the use of a specially prepared blasting gelatin, an explosive much safer than dynamite or nitroglycerine, on account of the insensitiveness to heat, friction or concussion. Straight blasting gelatin is a nitroglycerine and guncotton composition and is not especially adapted to well shooting, on account of its tendency to harden shortly after manufacture so that it can not be made to conform to the size or shape of the desired shell or container.

Blasting gelatin, for well-shooting purposes, is prepared by the addition of wood pulp in certain proportions in order to make it plastic so that it can be gotten into shape for the container.

METHOD OF SHOOTING WELLS WITH BLASTING GELATIN.

Electric detonators which are especially prepared to withstand the pressure to be contended with in oil-well shooting, are embedded in the blasting gelatin and then connected in series so as to insure a simultaneous explosion of the entire charge. The torpedo or container, when loaded, is lowered into the well to the shooting depth by the sand line, and the waterproof leading wires from the electric detonators are connected to a blasting machine, or power circuit, at the surface. The charge of gelatin is then detonated by electric current at the desired moment.

Following is a table giving the amount of blasting gelatin held by various sized torpedoes per foot. The diameter of the torpedo is regulated so as to carry the desired amount of explosive per foot. The largest diameter of a torpedo used is usually about one inch less than the diameter of the smallest casing through which it has to be run.

Diameter of torpedo in inches	Pounds per foot	Diameter of torpedo in inches	Pounds per foot
1	½	4½	11¾
1¼	9/10	5	14½
1½	1¼	5½	17½
1¾	1¾	6	21
2	2¼	6½	24¾
2¼	2¾	7	28¾
2½	3½	7½	33
2¾	4¼	8	37½
3	5¼	8½	42½
3¼	6	9	49
3½	7	9½	53
3¾	8¼	10	58
4	9¼		

The amount of explosive used should be regulated by the physical condition of the well between the shooting depth and height of fluid above the shooting point and results desired. In some wells where shooting is recommended by the State Mining Bureau, the approximate amount of explosive to be used is specified. In most cases where shooting is to be done it is advisable for the well owner to consult with an expert shooter relative to the exact amount of explosive which should be used in each shot.

An advantage of shooting with gelatin is that the force of the explosion may be directed by the spacing and placing of the detonators. Blasting gelatin generally used in California well shooting generates 1300 volumes of gas under an initial pressure of 15 tons per square inch. The definition of the word ''explosion'' used herein is as follows: ''The release of a large volume of gas generated under great pressure.''

During drilling operations various tools or portions of casing may be lost and obstruct or prevent further drilling before removal. In many cases it would be more economical to displace such obstructions by shooting, rather than drill them up or fish them out.

It is advisable to shoot in the majority of wells where oil- and water-bearing formations are penetrated by casing which can not be removed, and in which it becomes necessary to plug between certain depths.

In practically every case it is necessary to shoot wells which have one or more strings of sidetracked casing, which may serve to conduct water into or between oil-bearing formations, in order that all holes may be converted into one large one and plugged between certain depths to prevent the passage of water. It sometimes becomes necessary to shoot with a small amount of explosive to create a ''pocket'' in which to make a shot large enough to obtain the desired results. In cases of this kind, where the ''pocket'' has been made, the torpedoes are made of comparatively short lengths connected by wire so as to allow them to pass and rest alongside of each other in the hole. This method of shooting is employed where there is sidetracked casing, which may be a number of feet from the hole in which the shooting is done and where it is necessary to shoot all holes together in order to plug with cement.

Probably most of the oil-well shooting is done for the purpose of severing casing at a certain depth in order to permit removal of the upper portion. There are instances in which casing has been shot off inside of other casing without rupturing the outer casing. This was done by the use of a coupling locator below which was attached a small charge of explosive calculated for the requirements of such work. A coupling locator is a tool which resembles a latch-jack and is run on the sand line. After a collar or coupling on the casing, nearest to the desired shooting depth, has been located, the charge of explosive is detonated opposite such collar.

Wells penetrating hard formations may be shot instead of under-reamed, in order to allow casing to follow the tools. ''Crooked'' hole in drilling wells, caused by hard formations standing at a steep angle with the horizontal, may be straightened by shooting between proper depths.

Shooting has been resorted to instead of perforation to permit fluid to enter through the oil string, in some wells.

The production of some wells has been increased by shooting in hard or close-grained formation, shattering it so as to allow fluid to enter the well more readily.

Thanks are due to Messrs. C. H. Allison and A. Leslie Oliver for assistance in preparing this information for publication.

A METHOD OF REMOVING CASING AND PLUGGING WELLS USED IN THE KERN RIVER FIELD.

By G. McGregor, Petroleum Engineer.

Shooting pipe for the purpose of plugging is not looked on with much favor in the Kern River field, for two reasons: First, there are so many sands with thin shale streaks between that it would be a very expensive piece of work to separate each oil sand by shooting in the hard strata between them and putting in a bridge. In the second place the lower shales do not seem to resist the action of water. When drilled into they appear to be tough but after being subjected to the action of water, they seem to become softened very much as lime does upon becoming air slacked. Consequently, they do not make ideal places in which to put cement plugs.

Added to the above is the uncertainty of the records, which are so unreliable that it is unusual to find the formations in a well as they appear on the log. Consequently, one could never be sure of placing a shot where it would be of any use.

The alternative has been the method employed by the Peerless Oil Company and, with minor modifications, by other companies in this field.

The method is as follows: The casing is cut in short lengths, usually about 5 feet long, and then starting with the bottom piece is ripped. The ripper is run as long as it will take hold, usually three to five rips being cut in each piece of casing. The ripper is then raised to the next cut and the process repeated until the entire joint is thoroughly ripped. The ripper is next raised above the collar which is ripped or knocked off. The next step is to run in with the tools, get on top of this ripped casing and pound it down. In some cases a 20′ joint of pipe has been pounded down until it only occupied 3′ of hole.

In conjunction with this method, clay and cement are used and the open hole below the unripped pipe is filled and tamped. Then the process is repeated with the next joint of casing until the desired height is reached. In this way a solid clay plug is put in, mudding up the sand and re-inforcing the shales as it is built.

Mr. D. W. Wells, of the Peerless Oil Company, has used this method almost exclusively among the wells worked on, being numbers 5, 26, 33, 41, 42, 43, 49, 53, 54 and 67.

The method is only employed in plugging wells where it is impossible to pull the casing. No attempt is made to replace shooting by this method where it is desired to sidetrack the casing or to loosen it for pulling.

An amusing incident encountered by this department in connection with the above method illustrates the tendency of some superintendents to cling to established methods and refuse to even consider a new procedure. The method was specified by the department as part of the work on a certain well in the Kern River field but the superintendent entered emphatic protest, stating that the method was impracticable if not a physical impossibility, showing that he had not taken the trouble to keep informed on present day operations in plugging wells used at near-by properties.

METHOD OF MUDDING WELLS AS PRACTICED IN THE KERN RIVER FIELD.

By G. McGregor, Petroleum Engineer.

For many years it has been a matter of common knowledge that large areas in the Kern River field have been greatly damaged by water flooding the producing sands and, while generally admitted to be a menace, concerted and concentrated action to remedy the evil was not undertaken. This was probably due to two causes: First, definite methods of combating the water were not in vogue; and second, the period of depression in the oil industry during which the receipts were so light that smaller operators did not feel justified in spending any considerable sum for repairs.

In the last few years, however, the recognition of the use of clay as a remedy and the increase in the price of oil has caused much repair work to be undertaken and in nearly every instance the work done has been very beneficial to the company doing the work, and in many cases the neighbors have profited by the work done.

The methods in which wells are plugged with clay may be roughly divided into two classes:

1. Where the clay is mixed in the well; and
2. Where the clay is mixed on the surface and placed in the well in liquid form.

Advocates of both systems are very staunch in their support of their particular method.

In the first method cable tools are used, being allowed to swing at the particular spot where it is desired to mud. The clay is then shoveled dry, or slightly moistened, into the top of the casing along with a constant stream of water. The water serves a double purpose of preventing the clay from "bridging" when it strikes the fluid level and also to a certain extent increases the head of water in the casing, thus helping to carry the clay out into the formations. The action of the tools swinging in the open hole is similar to the action of rotary drill-pipe and as the clay settles down around the tools it is pounded back into the formation. Care must be taken that the tools do not become "mudded up" or that circulation does not stop while clay is being put in.

The Del Rey Oil Company used this method on their well No. 1, Section 5, Tp. 29 S., R. 28 E., M. D. B. & M. The well had to be redrilled and all the mudding done through 5⅝″ casing, the hole being plugged from 1095 feet up to 664 feet where a cement cap was placed.

Approximately 120 feet of oil sands were mudded off, the plan being to mud off the sands on the way down so as to keep the casing free and then put in a solid plug, as the pipe was withdrawn. About 850 cubic yards of clay, 4½ tons of iron cuttings and 25 wagon loads of manure were put in. The work lasted three months and cost in the neighborhood of $3500 exclusive of the cost of a new derrick.

Various companies using the second method, namely, mixing the mud before it is put in the well, differ slightly in their methods.

The Associated Oil Company uses an ordinary concrete mixer to mix the clay which is then pumped into the well through a string of 3″ tubing. The first step is to clean the well to bottom and split up the old pipe in the well in order to allow the mud free access to the walls of the hole. A string of tubing is then inserted and the well pumped full of the mud fluid. The fluid in the hole is subjected to pump pressure. The well is then, by having tight head in the casing and gas clamps around it, allowed to stand under pressure to test the job. If the mud does not break away under the pressure test, the bottom of the tubing is placed in the lowest clay stratum where it is desired to cement, and after releasing a part of the pressure a certain amount of cement is pumped into the clay stratum. This process is repeated in all the strata in which it is desired to cement.

This system was used on M. & S. Well No. 10, Section 29, Tp. 28 S., R. 28 E., M. D. B. & M., which had approximately 170 feet of exposed oil sands. About 500 cubic yards of clay and 190 sacks of cement were used on the job which required only nine days, and cost approximately $2000.

The Standard Oil Company has a specially constructed mud mixer mounted on a wagon bed which is moved from well to well. The mixer consists of a box with a shaft running lengthwise to which are fastened paddles. The shaft is driven by a chain drive from an ordinary well engine whch is also moved about and connected with the steam line at the well to be mudded. A stream of water is allowed to run into the box and the clay shoveled in where it is thoroughly mixed. The mud is allowed to run out at one end of the box in any desired thickness. A trough extends from the mud-mixer to the well and the mud flows in by gravity.

When it is desired to "mud" a well, it is always cleaned out to bottom, or if the casing is in such shape that this is impossible, the well is redrilled. As the mud flows into the well, the lower string of casing is lifted frequently until a place is found where the mud goes away freely. As the hole fills with mud, the casing is withdrawn and the well filled to the top. An air line is then connected to the casing and air pressure of 275 lbs. per square inch put on the top of the mud column to force the mud down the well and thence back into the formations. In some cases, the column can be forced down a distance of 300 feet. The well is then filled to the top again and the process repeated until the hole will not take any more mud.

This system was used on Well No. 38, "M. C. No. 1.", Section 5, Tp. 29 S., R. 28 E., M. D. B. & M., where about 450 cubic yards of clay was put in. This work took about 13 days and cost in the neighborhood of $4150. The exposed oil sands were about 330 feet thick.

The Kern River Oilfields of California Ltd., uses still a different system in that they mix the mud in a large vat with steam brought into contact with the clay by means of a perforated coil of pipe and men using hoes. The liquid mud is then pumped into the well.

In all cases work commences at the bottom of the well, although in some cases it is necessary to drill a new hole beside the old one to get down to the original bottom depth. In some cases it is not necessary to fill the hole to the top because when circulation of water is stopped, the upper sands cave in on top of the mud and act as a cap while pressure is being applied to the mud below. In the cases where the hole is filled to the top, the well is allowed to stand under pressure. Sometimes the formations give way and the column of mud drops, when the hole is again filled and the pressure applied until a stable condition is obtained.

Well No. 2-B of the Kern River Oilfields of California, Ltd., on Section 33, Tp. 28 S., R. 28 E., M. D. B. & M., is a good example of the latter method. This well which had originally been drilled to 980 feet but in some former work had been plugged back to 896 feet, supposedly shutting off the water below that depth, was redrilled to 896 feet and cased to 883 feet. Tubing was run to a depth of 886 feet and mud was pumped into the well. After putting in 16 cubic yards, the clay showed in the adjoining well—No. 3-B. After 220 cubic yards had been pumped in the pump gauge showed pressure from time to time. There were 430 cubic yards pumped in through the tubing which was pulled, and 3 cubic yards more were put in. This well had about 260 feet of oil sand exposed. The cost of labor was about $700 and material $74, and the time about 57 days. No charge was made for casing on this job as enough casing was recovered from the old well to redrill with. This well was afterwards cleaned out to about 650 feet and put to pumping.

Another very interesting case was well No. 1-LL of the Kern River Oilfields of California, Ltd., on the same section. In this case a new hole was drilled about 8 feet from the original well. The old hole was 838 feet deep and the new well was drilled to 829 feet. The 7⅝″ casing was kept nine feet from bottom and circulation was obtained after pumping water into the well under pressure of 75 lbs. per square inch for fifteen minutes. As soon as circulation was obtained, the water gravitated into the hole. A packer was then set and after 120 cubic yards of clay had been pumped in, the pump pressure ran up to 375 pounds per square inch. The packer was then taken out and the 7⅝″ casing cut off at 652 feet, the upper portion pulled out and the packer again set at the cut-off (or 652′). After pumping in six more cubic yards (making a total of 126), the adjoining well (No. 2-L) began to show clay and a decrease in the amount of water pumped by No. 2-L was noticed. When 24 more cubic yards of clay (making a total of 150 yards) had been pumped in, the pump gauge again began to show pressure and the mud came to the surface between the 13½″ casing and the 9⅝″ casing, showing that in all probability the mud had broken through into the old hole and had then come back into the new above where the packer was set. The packer was then withdrawn. Well No. 2-L showed such a rapid decrease in water that it was taken off air and put on the beam as there was not enough fluid to handle with air. The water handled in No. 2-L decreased from about 1200 barrels daily to approximately 200 barrels daily. About two months later the water again broke in so work was resumed and 25 cubic yards more clay were pumped in which apparently cured the trouble. Approximately 175 cubic yards of clay were used in this hole which had about 400 feet of exposed oil sand. The work took about three weeks and cost in the neighborhood of $2687 of which $1400 was for labor and the remainder for material.

None of the above wells had flowing water to contend with although in practically every case they had to contend with the "bottom" water, which, while not under sufficient head to make it flow, still raises the fluid level high in the hole and seems inexhaustible. The depth of these holes ranged from about 700 feet to 1400 feet.

The foregoing cases are merely cited as typical examples of the various methods used and do not in any way represent the amount of repair work done in the field, as each of the above companies has worked on numerous other wells, and other companies have been and are, at the present time, engaged in repair work. Among these are: The Peerless Oil Company, Virginia Oil Company, Apollo Oil Company, Alma Oil Company, Kern River Oil Company, Tejon Oil Company, Calex Oil Company, Calloma Oil Company, and others.

COLLECTION OF FUNDS BY ASSESSMENT.

The collection of funds during the past fiscal year was made as provided in the original statute of 1915, chapter 718. Briefly, the details are as follows:

The money received from collection of the assessment comprises the oil protection fund and is used for two purposes: First, for the supervision by the Petroleum Department of the State Mining Bureau; and second, for the repair of oil wells. The rates, shown on the accompanying statement and used in determining the various items, are determined in accordance with sections 23, 24, 25, 46 and 47 of the said statute. The detailed method is as follows:

The sum of $45,000 is annually available for the support and maintenance of the department. One-tenth of the above mentioned sum of $45,000 is levied upon the oil land of the state. The remaining nine-tenths is levied upon the oil produced and the gas produced and sold. For the purpose of this assessment 10,000 cubic feet of gas is considered equal to one barrel of oil. The amounts of land, oil and gas and the number of producing wells in the various counties were determined to be as follows:

County	Land (acres)	Oil (bbls.)	Gas (10 M)	Wells (No.)
Fresno	12,703	14,048.105	5,437	944
Kern	56,122	52,278,238	1,229,680	4,246
Los Angeles	2,174	2,400,811	63,584	531
Orange	3,297	13,048,749	324,267	458
Ventura	1,523	904,013	------------	332
Santa Barbara	9,808	4,361,241	82,090	349
San Luis Obispo	772	5,670	------------	2
Santa Clara	80	16,368	------------	11
Totals	86,479	87,063,195	1,705,058	6,873

The money which was previously collected to be used in repairing wells is available for use only in the county where collected. Expenditure in repairing wells is to be repaid by satisfaction of a lien upon the property where the work is done and therefore little or no further assessment is to be expected for repairs. The assessment for the repair work was levied in the same manner as that for supervision, namely, one-tenth on the oil land and the remainder on oil produced and gas produced and sold. The rates applied in levying the total assessment are $.052 per acre of oil land and $.000456 per barrel of oil or per 10,000 cubic feet of gas.

FINANCIAL STATEMENT.

By W. W. THAYER, Secretary.

CALIFORNIA STATE MINING BUREAU.

Statement of Receipts and Disbursements from "Oil Protection Fund" (Chapter 718, Statutes 1915), for the Department of Petroleum and Gas, for the Period of July 1, 1916, to June 30, 1917.

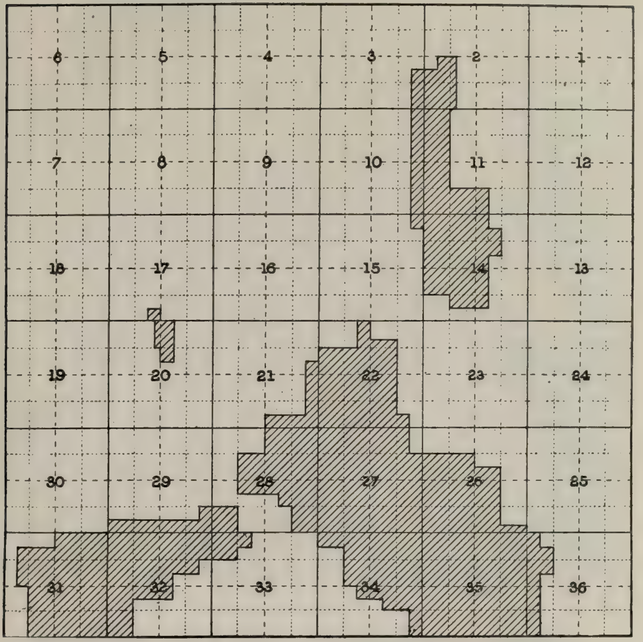
RECEIPTS.			
Balance for sixty-eighth fiscal year		$561 36	
Receipts from assessments for Oil Protection Fund		140,537 57	
Refund of auto license fees paid state		43 50	
Total			$141,142 43
DISBURSEMENTS.			
Reimbursement of General Fund for appropriation		$20,000 00	
Expenditure for support of Department of Petroleum and Gas from balance from sixty-eighth fiscal year		84 74	
Office of headquarters:			
Salaries	$14,481 84		
Equipment	3,066 40		
Traveling expenses	1,199 16		
General expense	2,343 18		
Printing	829 68		
Total		21,920 26	
Los Angeles Office:			
Salaries	$5,502 27		
Equipment	1,177 00		
General expense	1,691 32		
Total		8,370 59	
Coalinga Office:			
Salaries	$4,904 55		
Equipment	1,408 45		
General expense	1,559 39		
Total		7,872 39	
Taft Office:			
Salaries	$8,399 65		
Equipment	1,221 00		
General expense	3,364 07		
Total		12,984 72	
Santa Maria Office:			
Salaries	$2,400 00		
Equipment	909 25		
General expense	1,245 43		
Total		4,554 68	
Unexpended balance		65,355 05	
		$141,142 43	$141,142 43

The above statement represents the total receipts of and disbursements from the Oil Protection Fund.

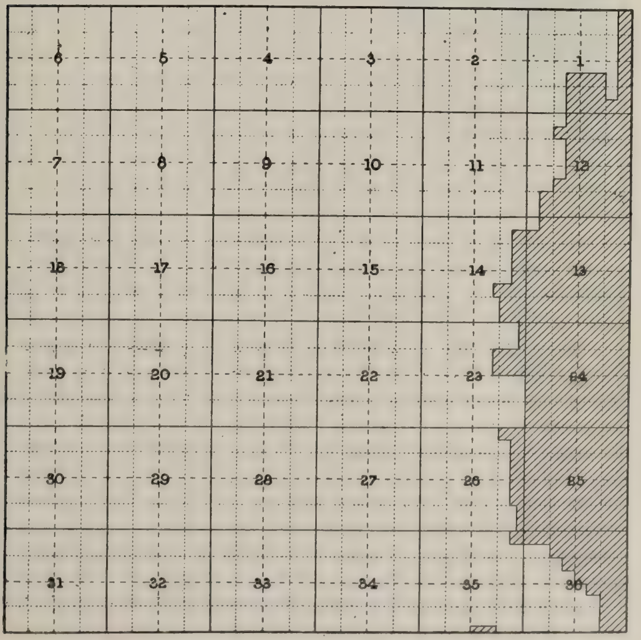
W. W. THAYER, Secretary

PROVED OIL LAND ASSESSED.
March —, 1917.

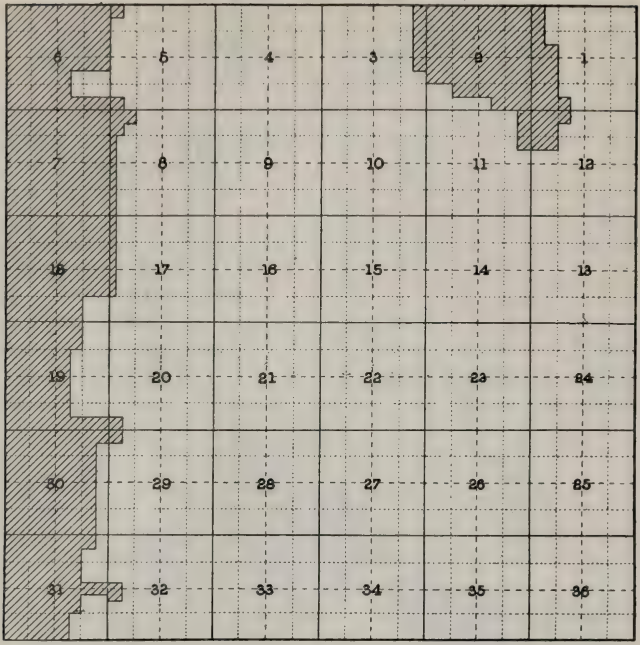
T. 19 S., R. 15 E., M.D.M. — Fresno County.



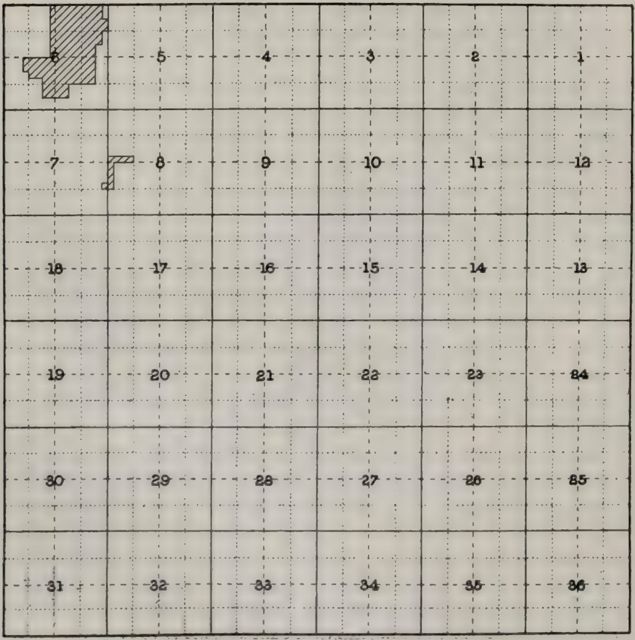
T. 20 S., R. 14 E., M.D.M. — Fresno County.



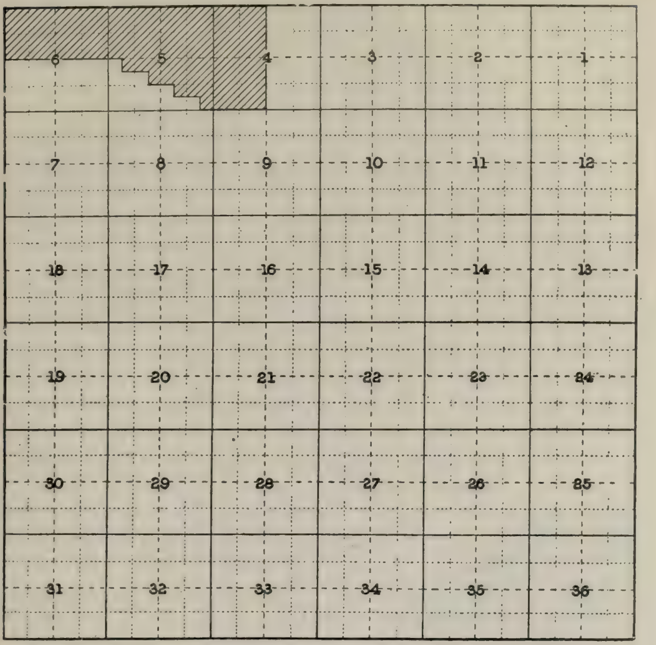
T. 20 S. R. 15 E. M.D.M. — Fresno County.



T. 21 S., R. 15 E., M.D.M. — Fresno County.



T. 11 N., R. 23 W., S. B. M. — KERN COUNTY.



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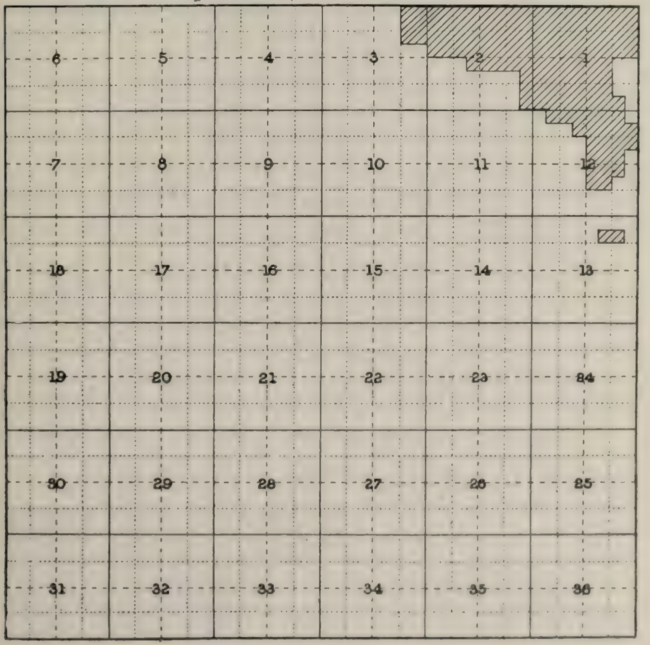
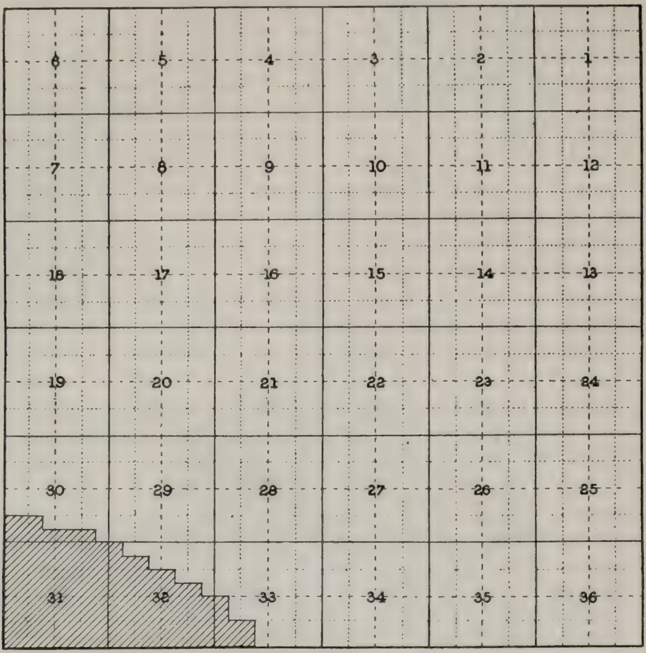


T. 12 N., R. 23 W., S. B. M. — KERN COUNTY.



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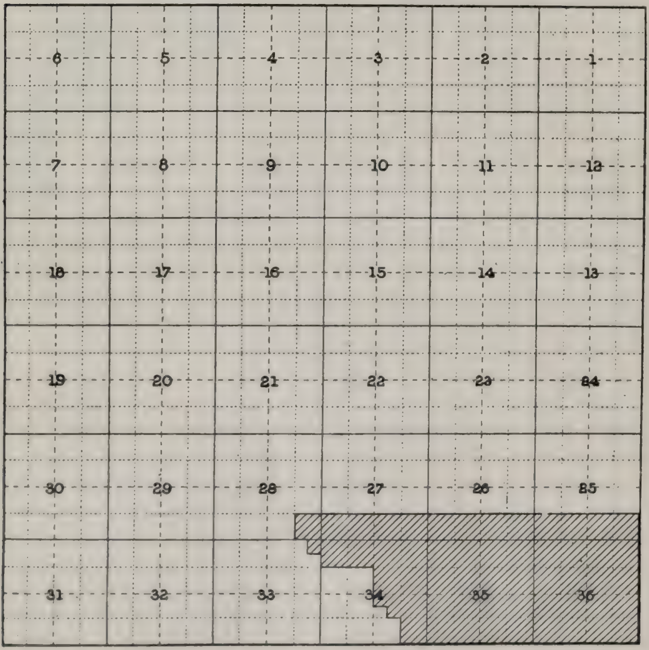
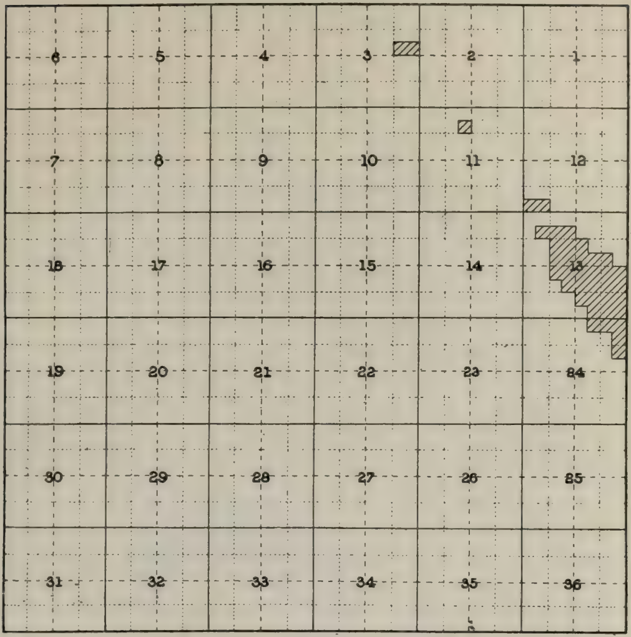
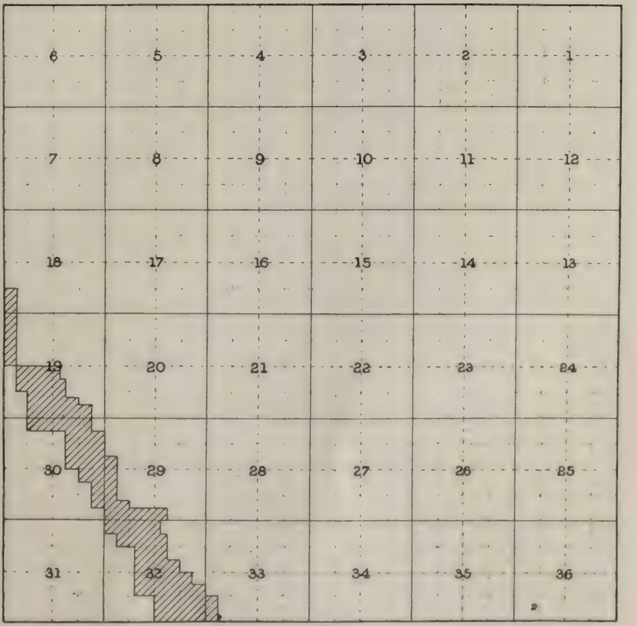


T.26S. R.20E., M.D.M. — Kern County.



T.26S., R.21E., M.D.M. — Kern County.



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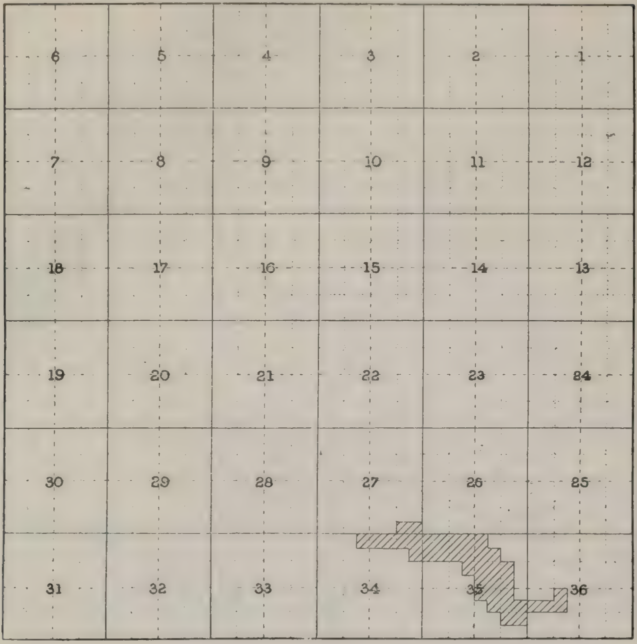

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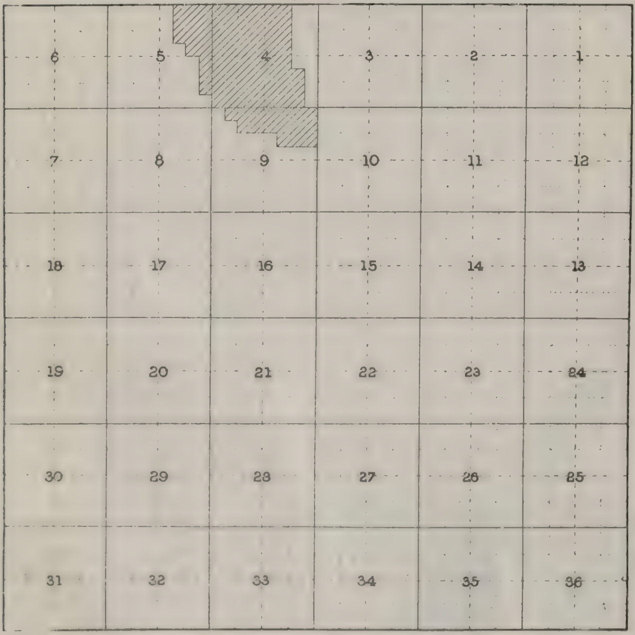
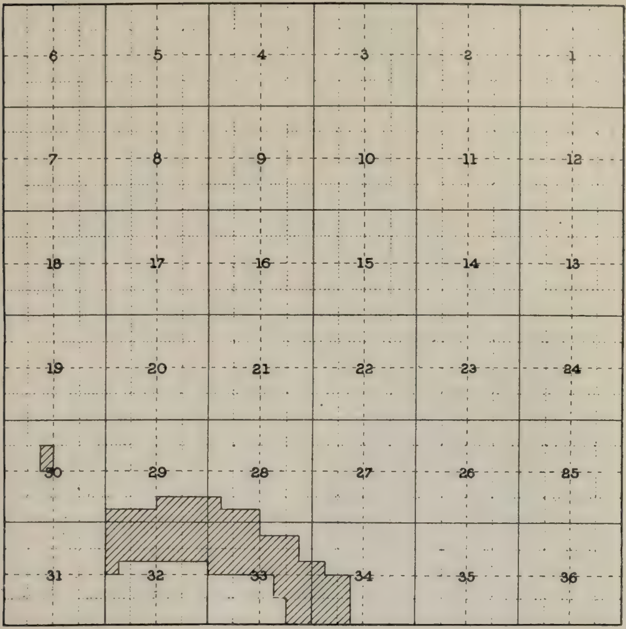


T.28 S., R.21 E., M.D.M. — Kern County.



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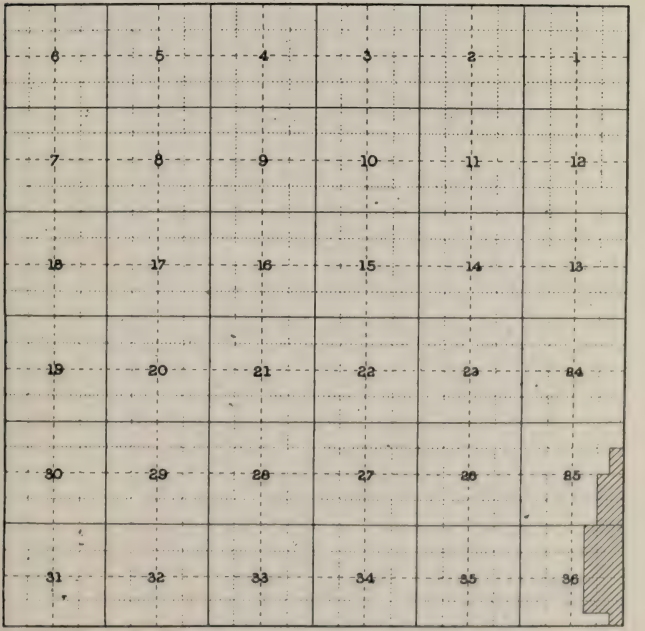

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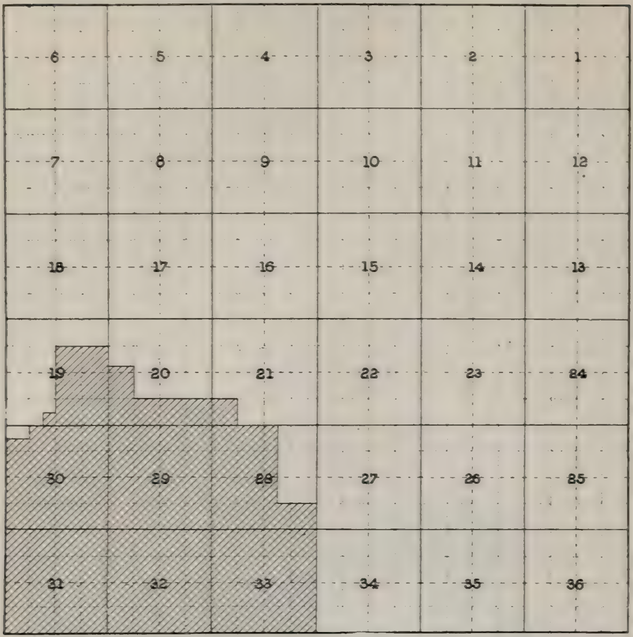

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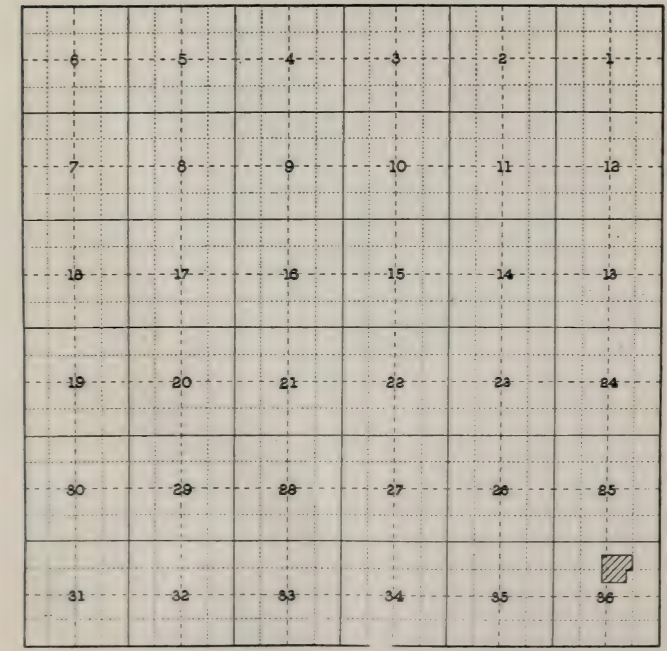

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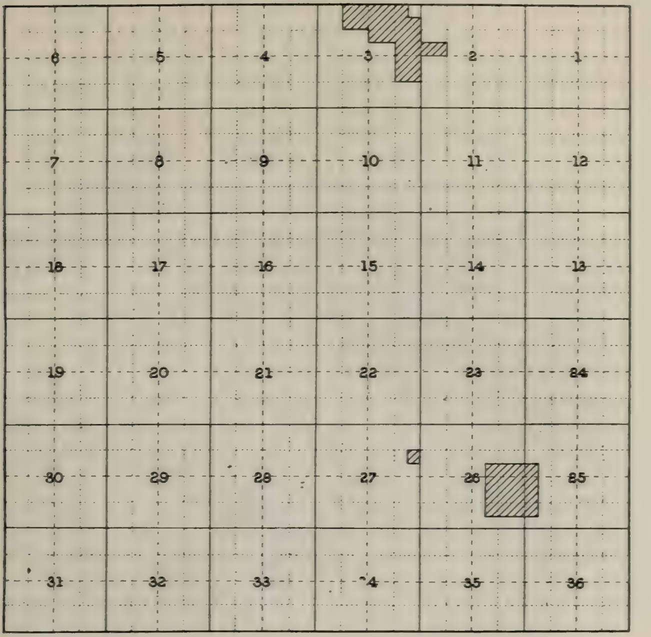

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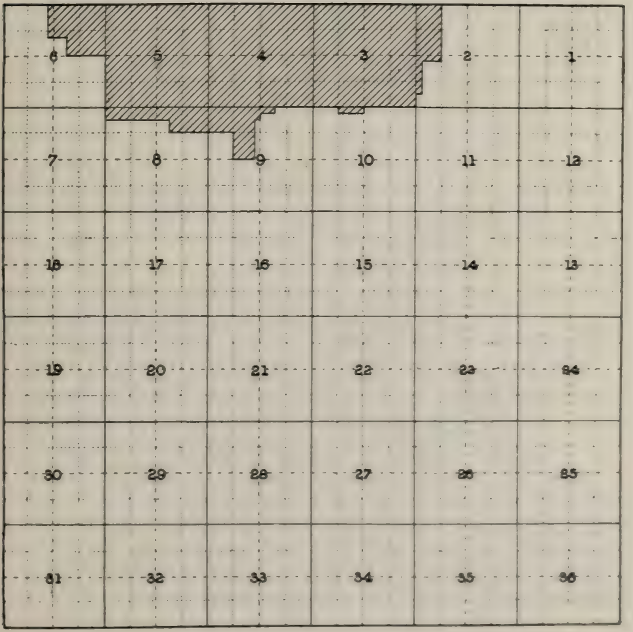

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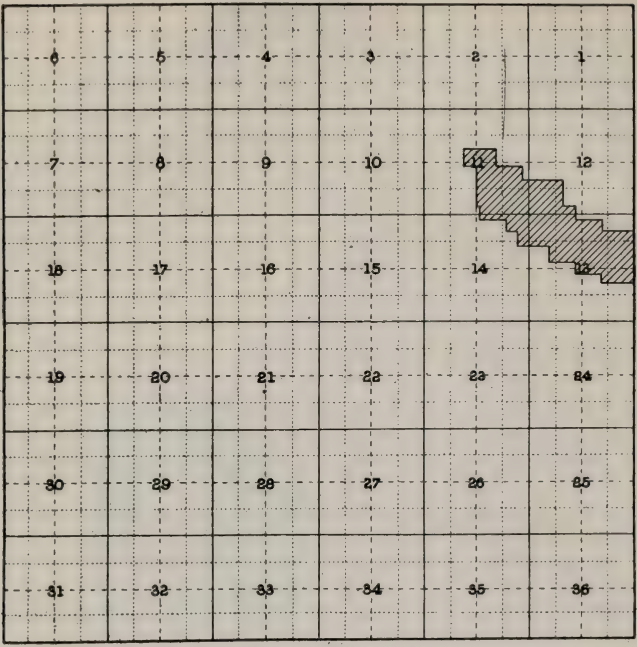

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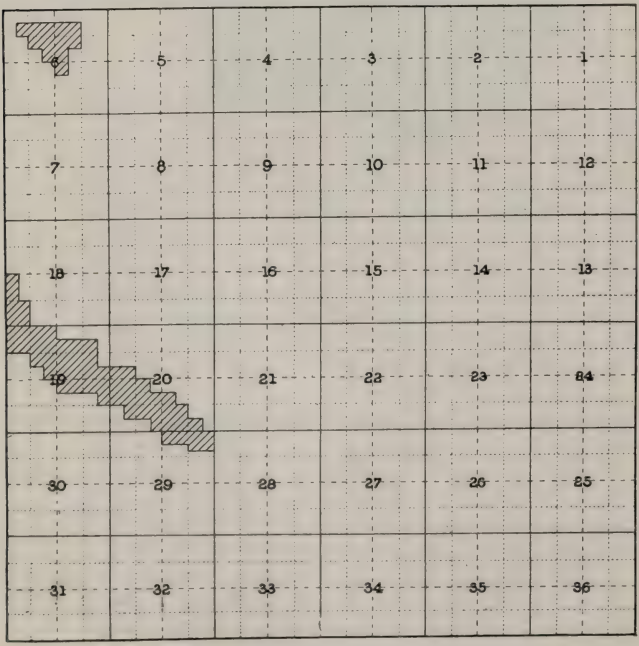

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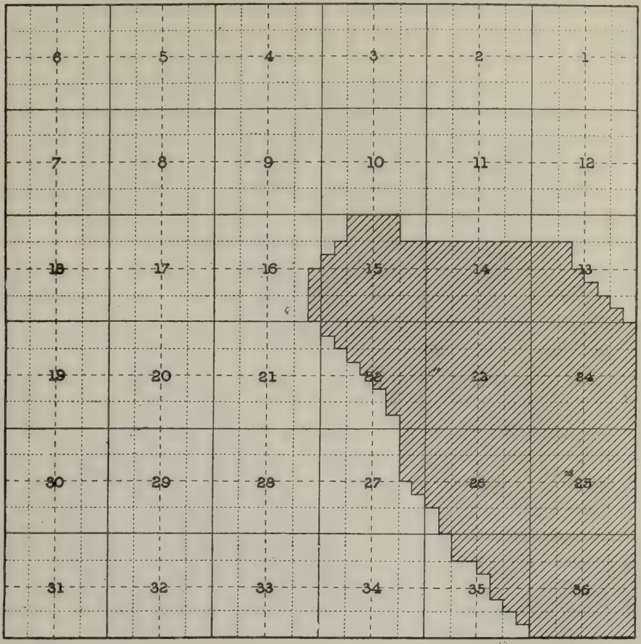

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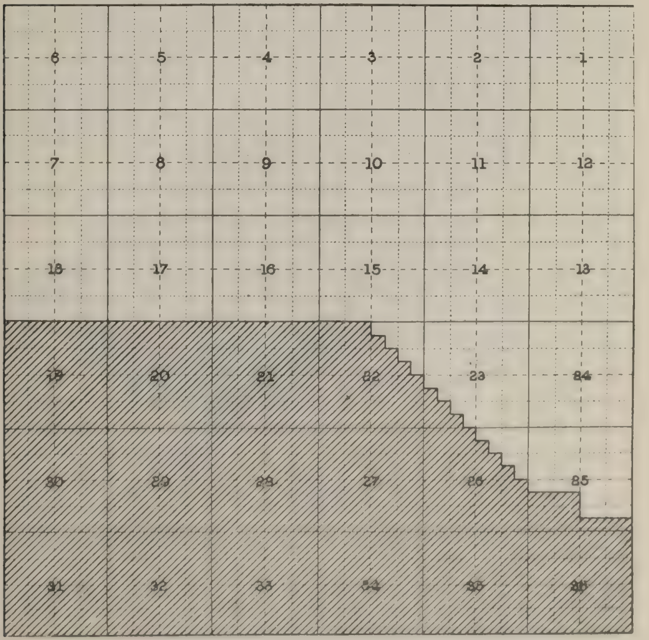

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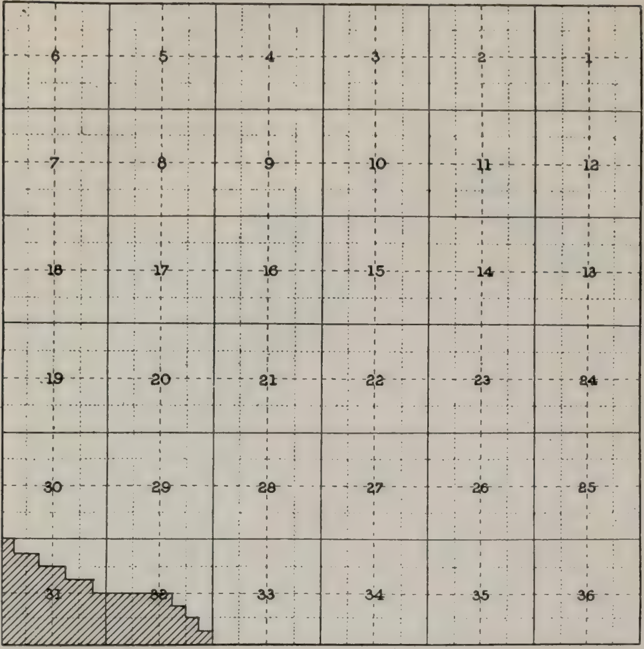

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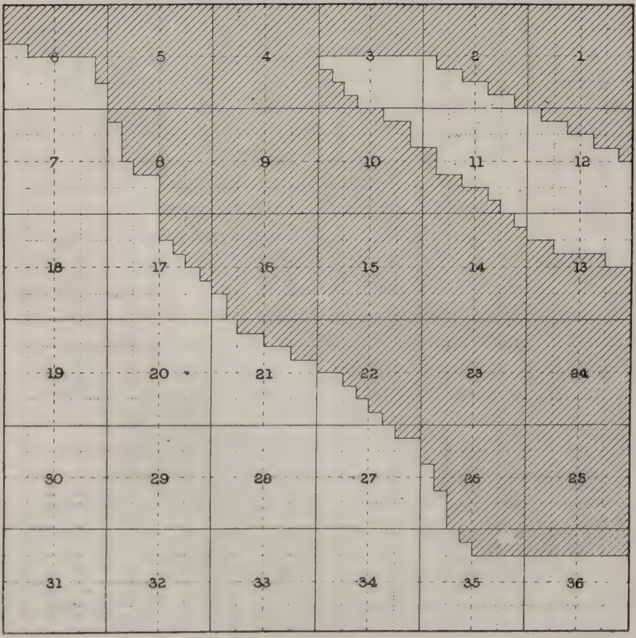

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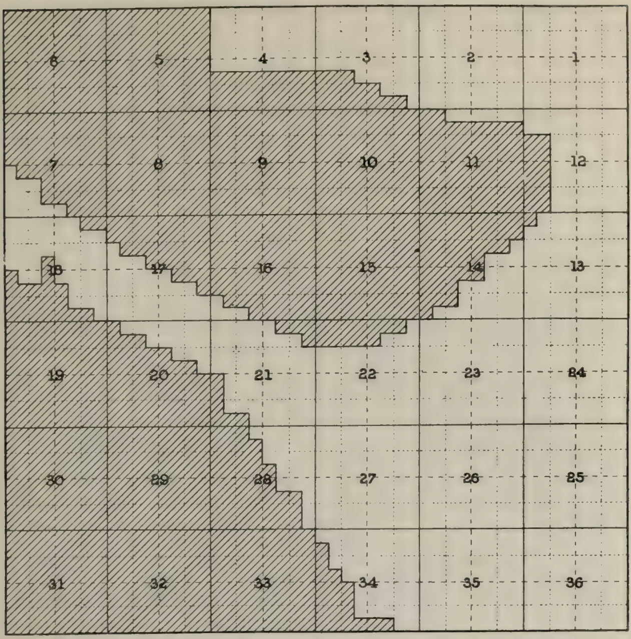

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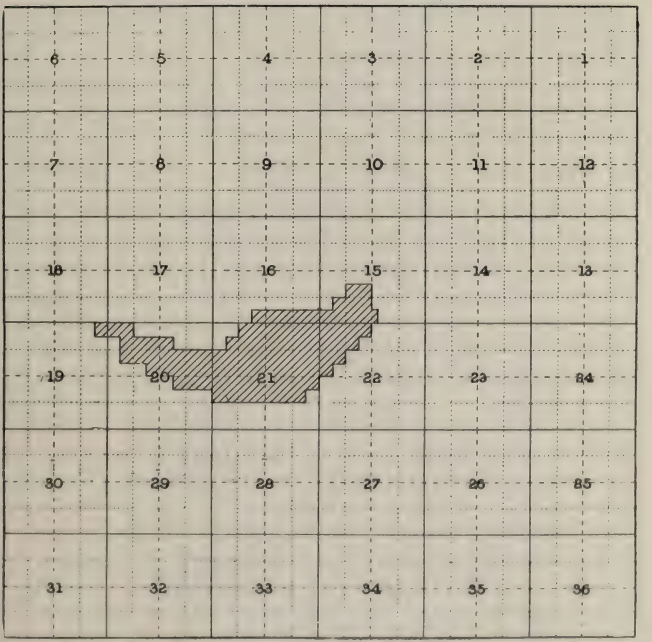

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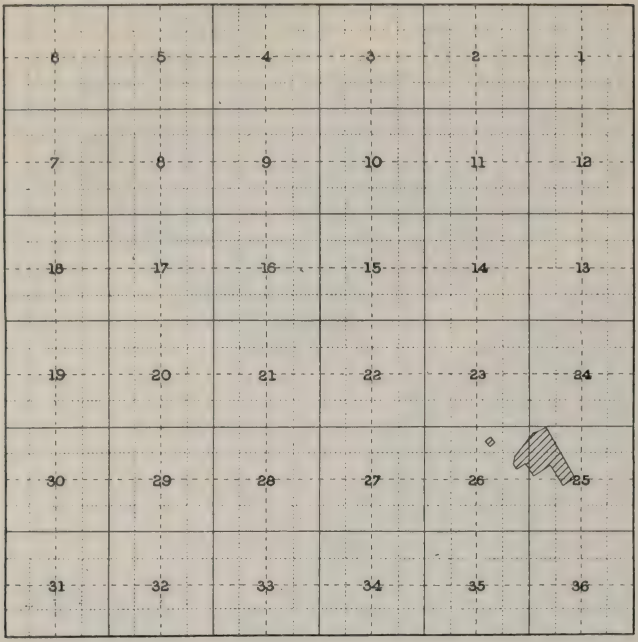

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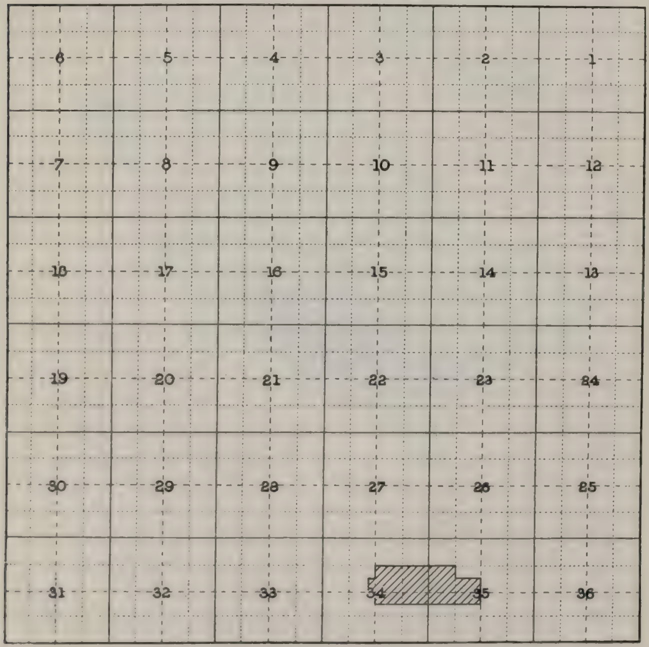

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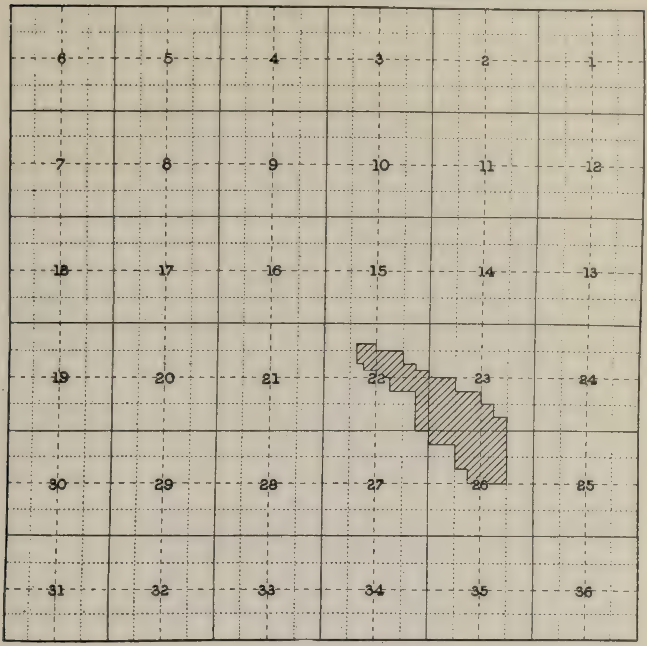

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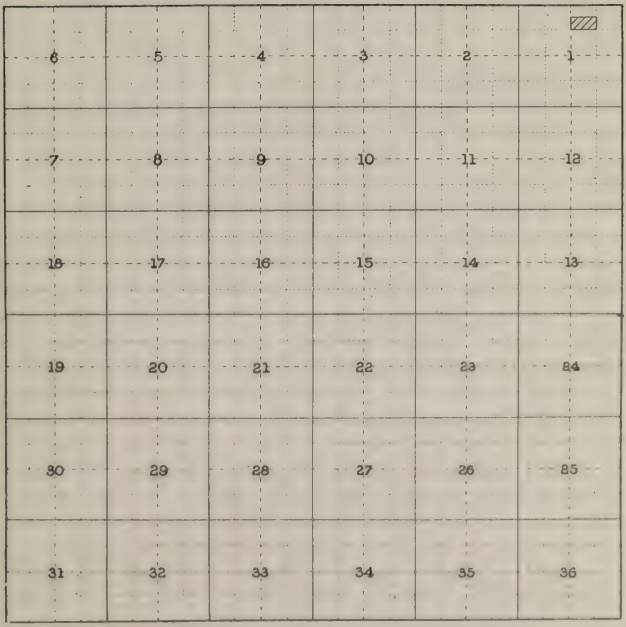

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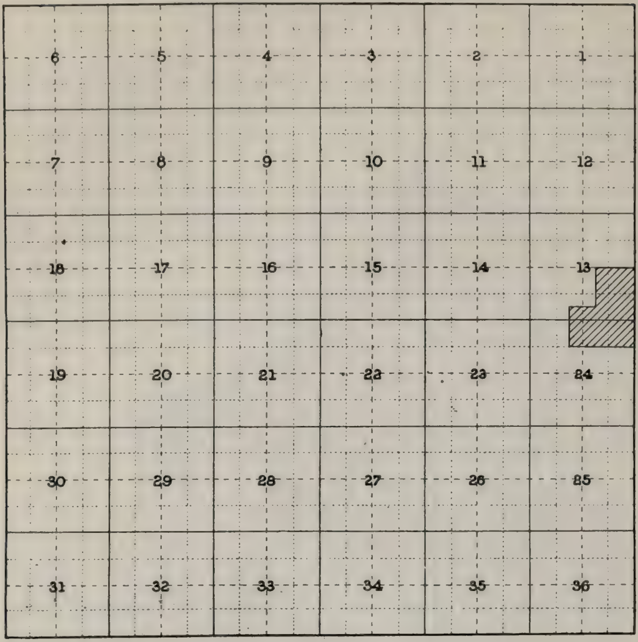

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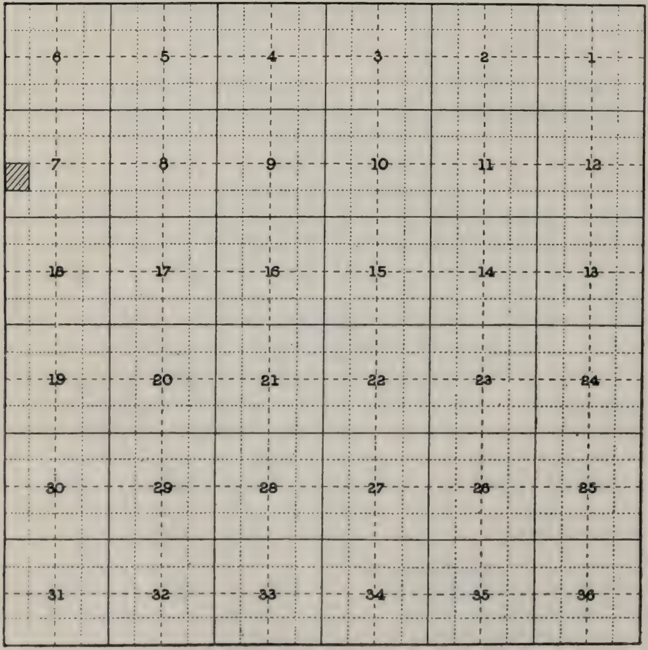

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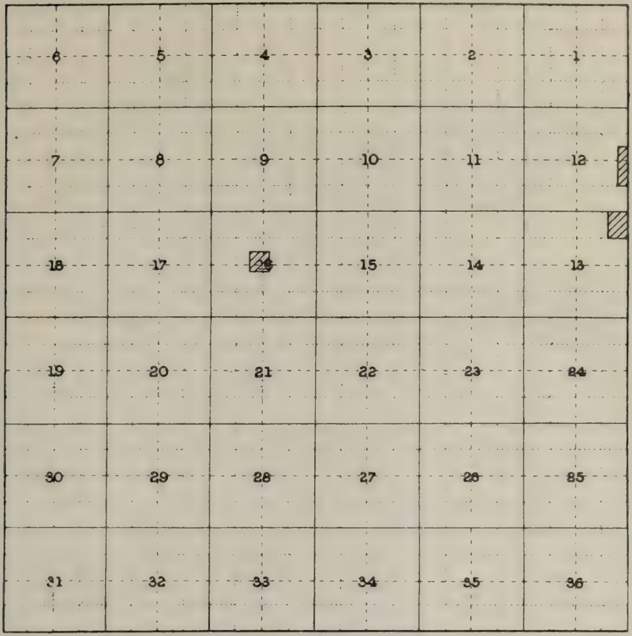

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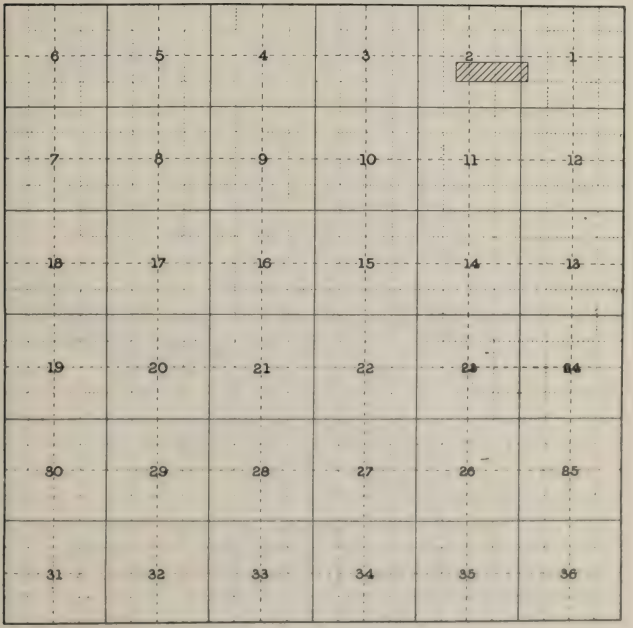

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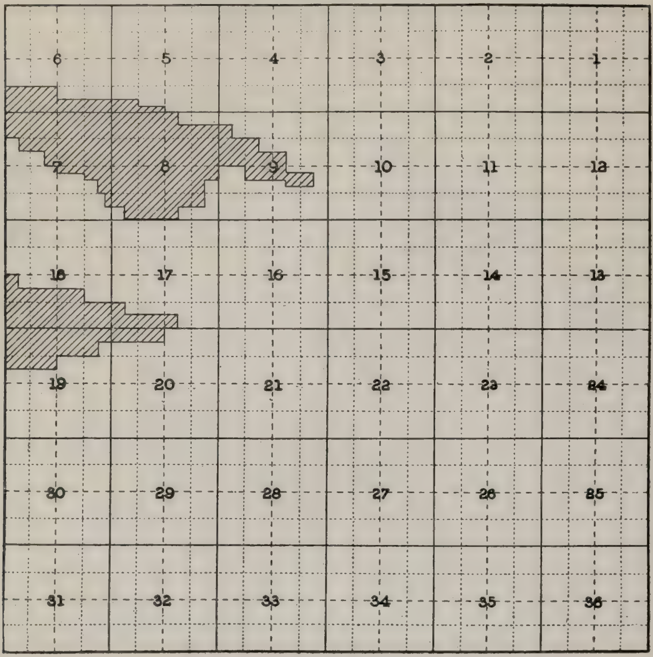

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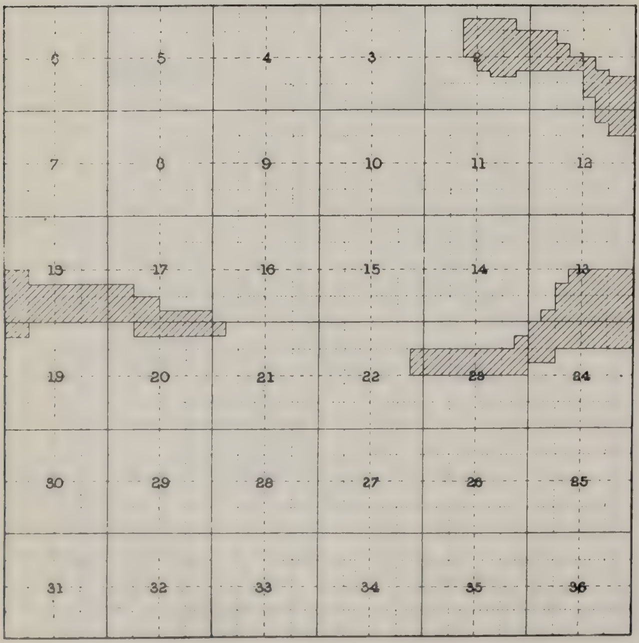

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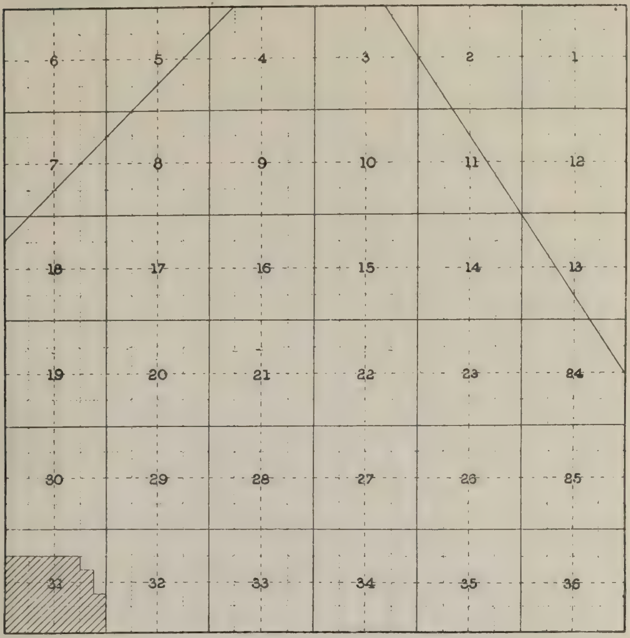

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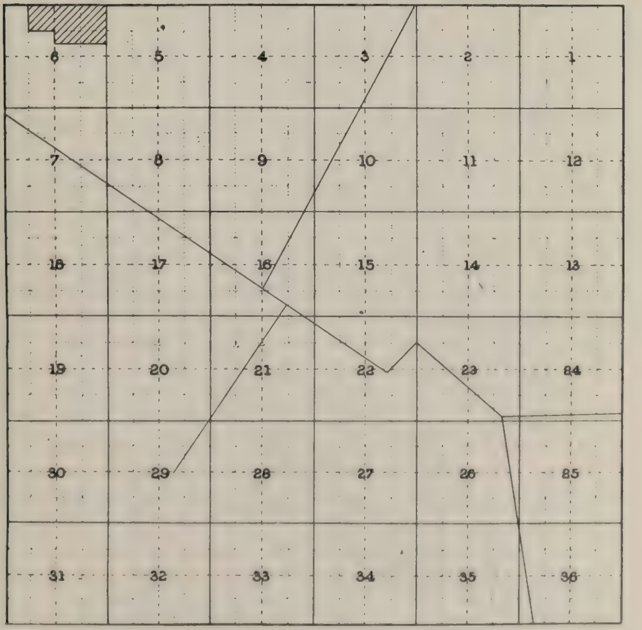

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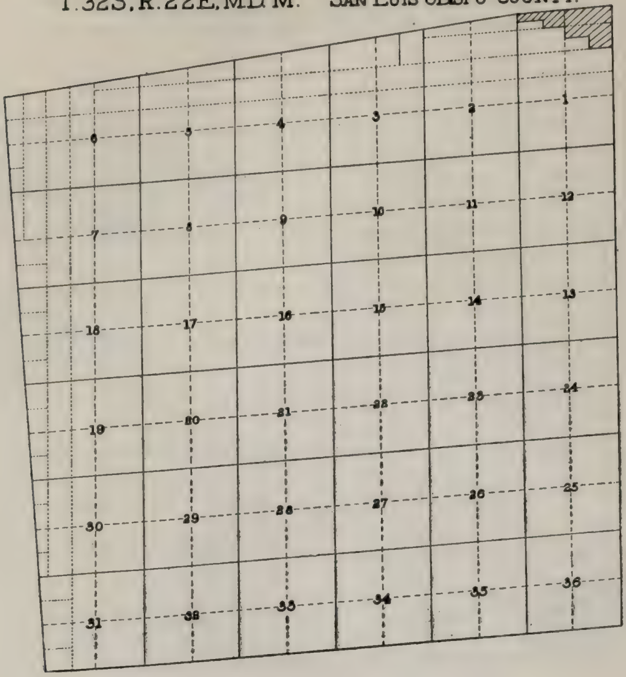

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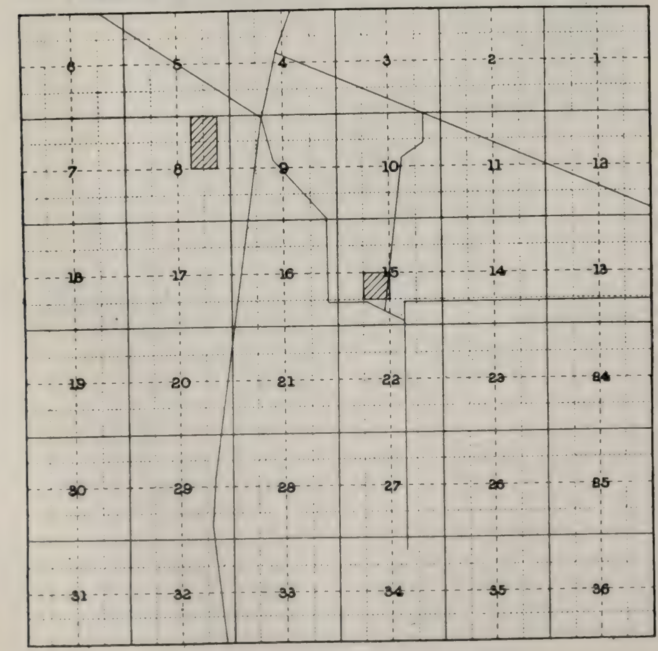

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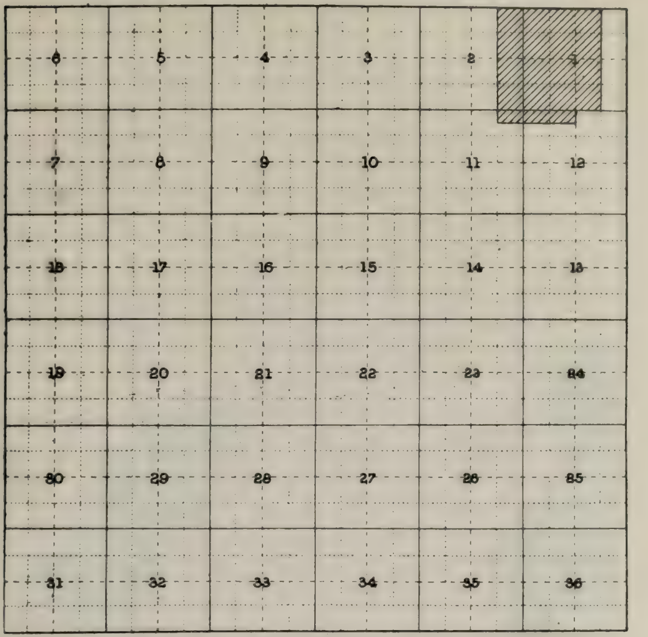

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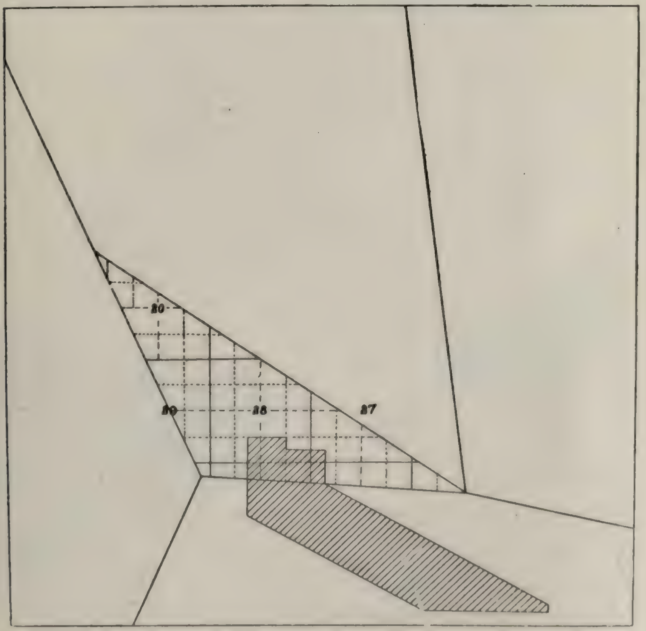

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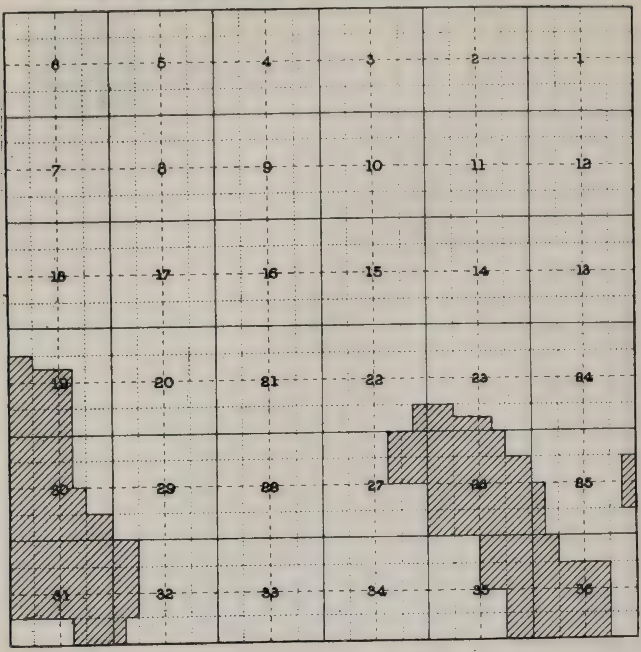

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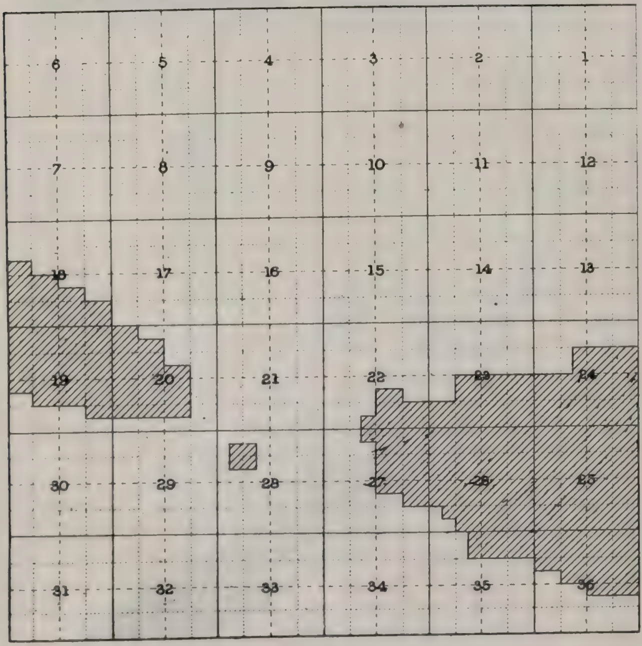

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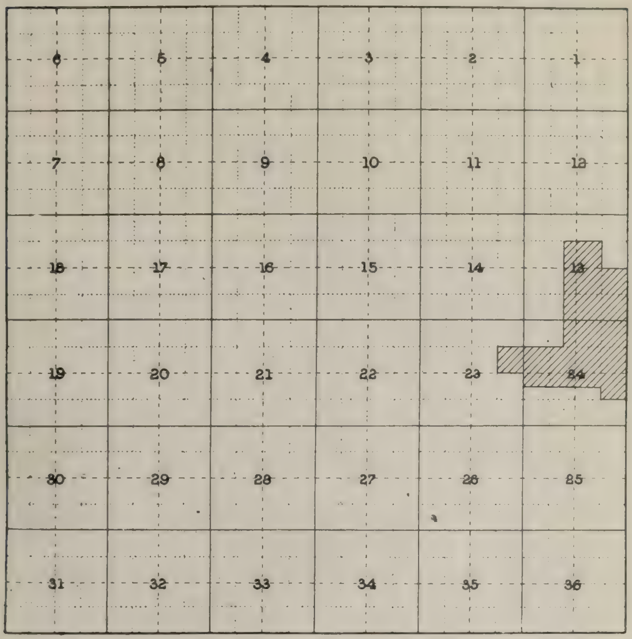

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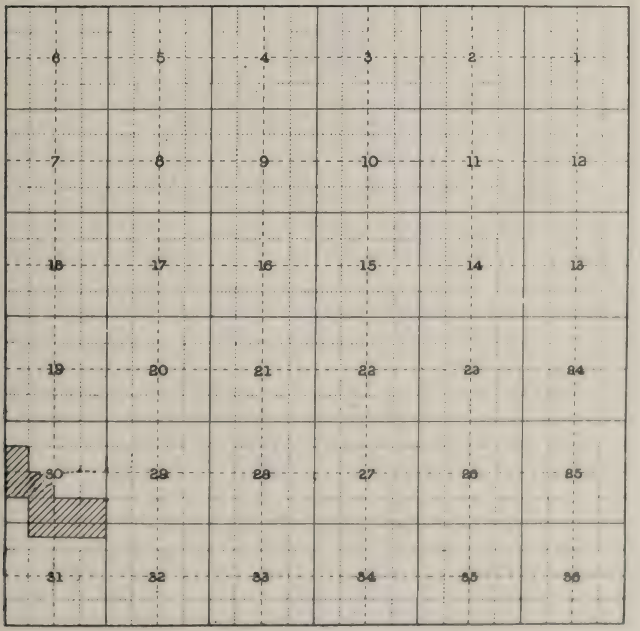

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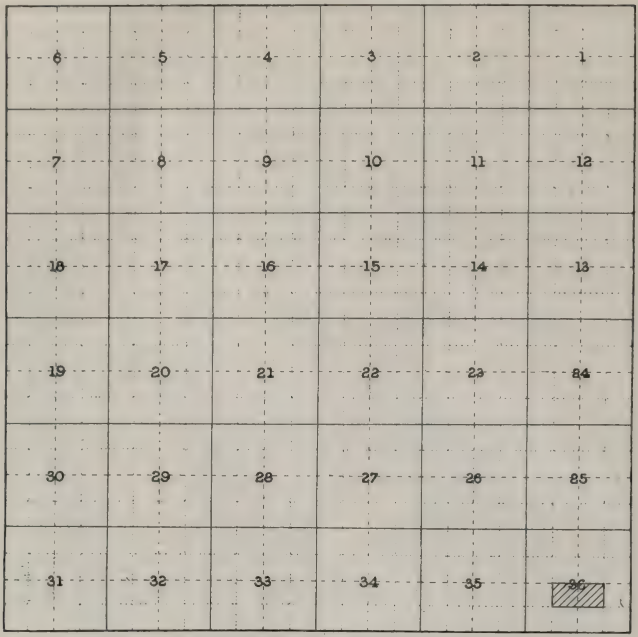

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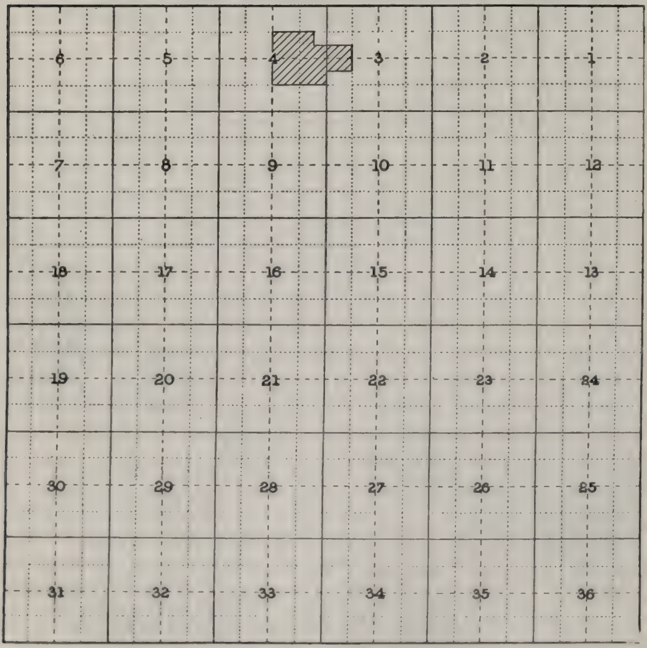

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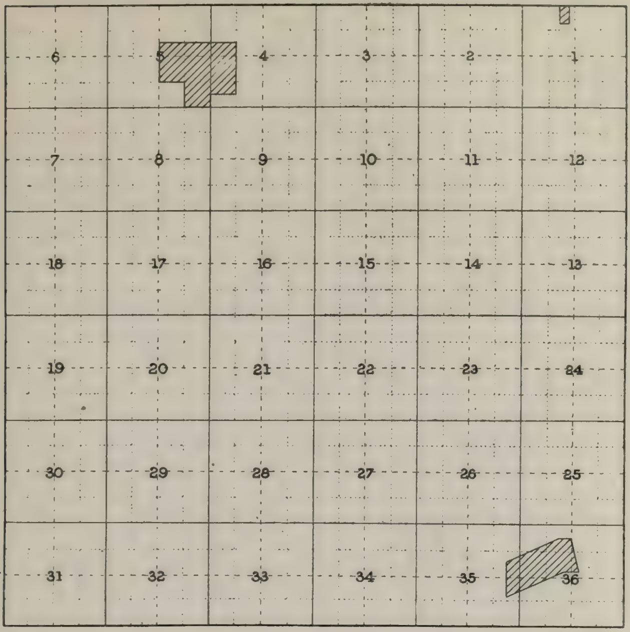

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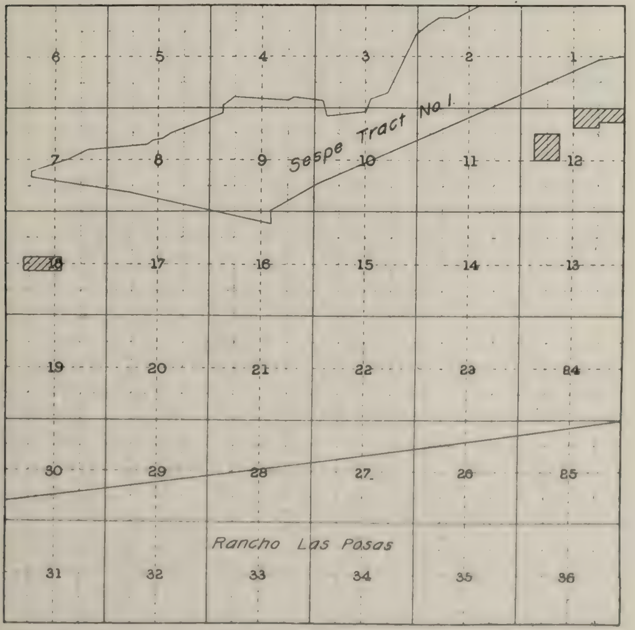

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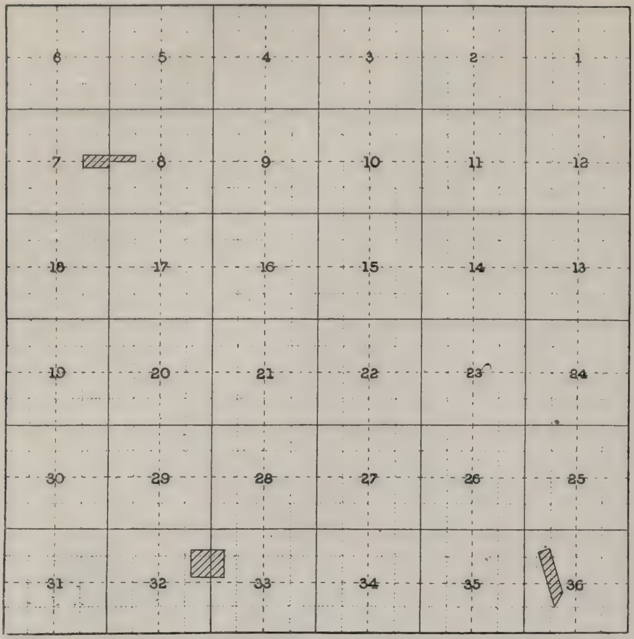

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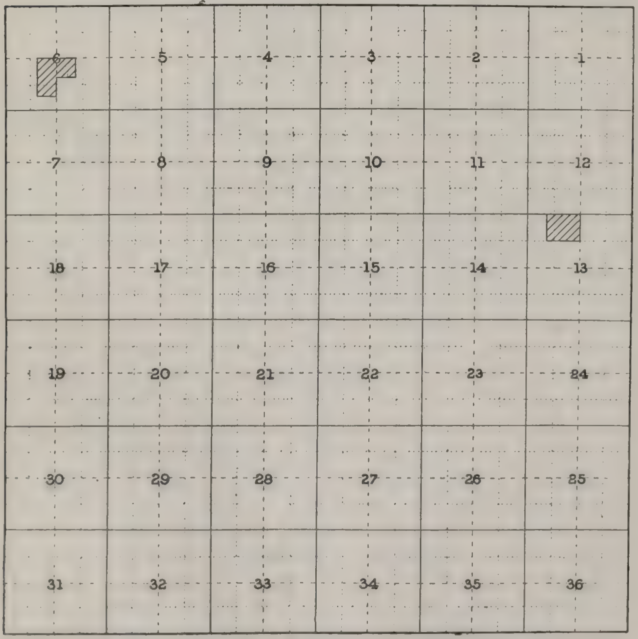

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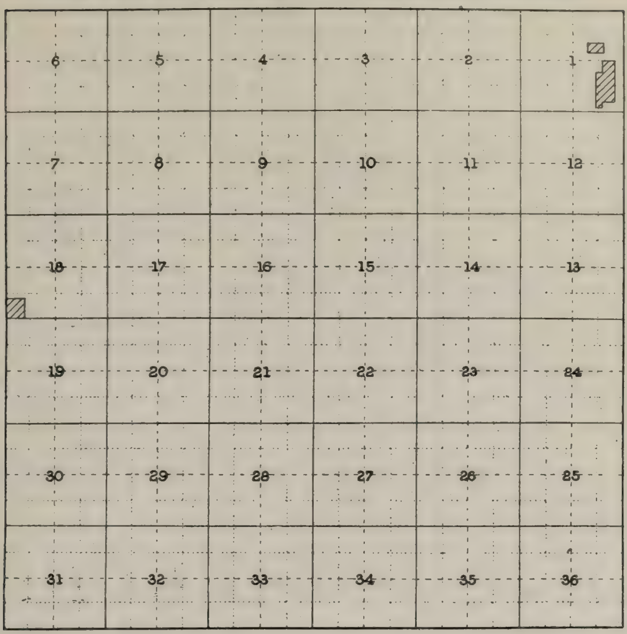

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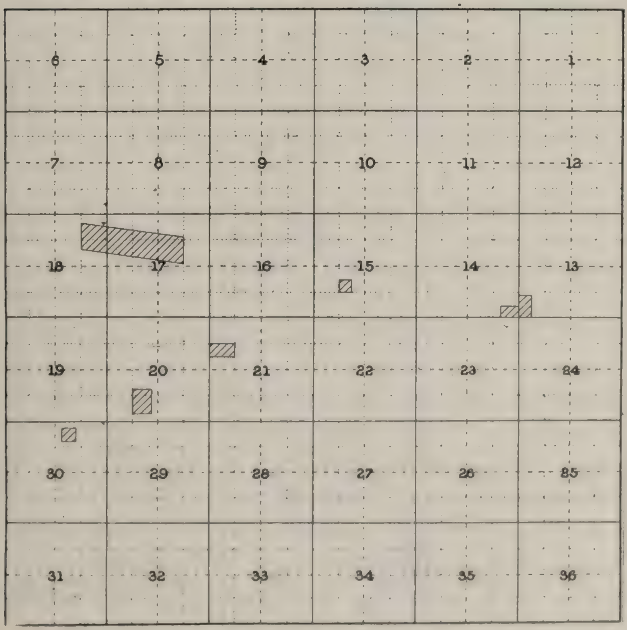

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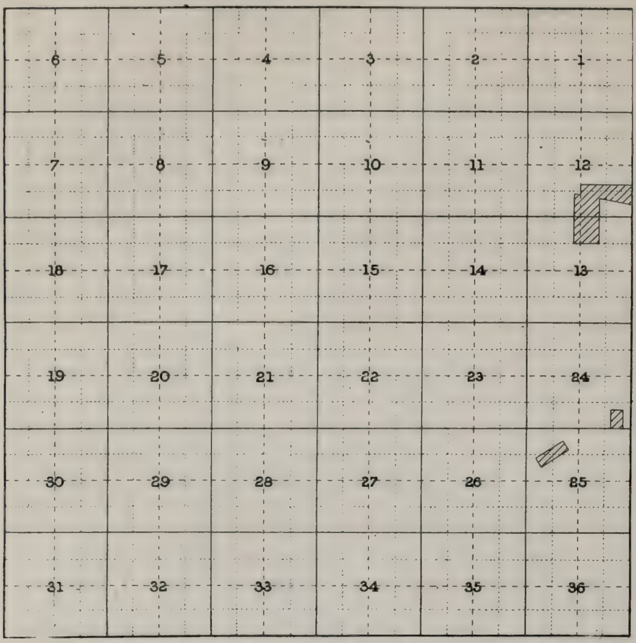

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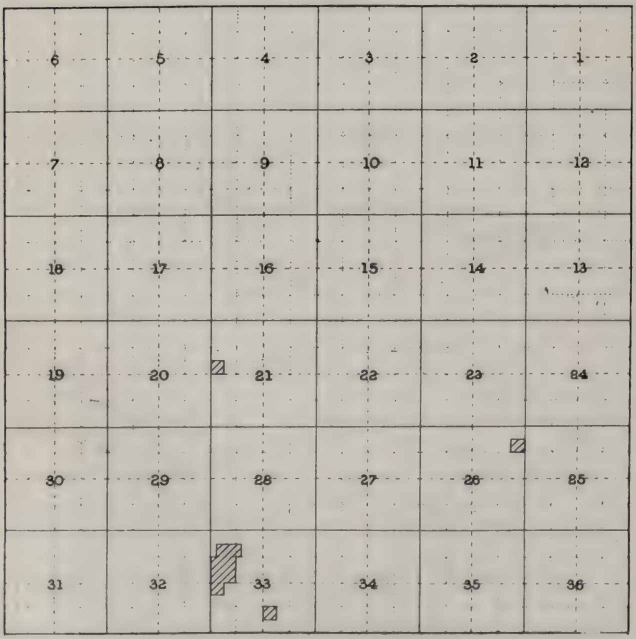

WORK OF DEPUTIES IN VARIOUS FIELDS.

The work carried on at our various local offices is shown by the following tabulation:

Deputy, office address and counties covered	Notices and decisions				Acres proved land	Number producing wells	Logs filed	Graphic logs	Models, acres
	New wells	Shut-off	Deepen and redrill	Abandon					
M. J. Kirwan, 520 Union League Bldg., Los Angeles, Cal.—Los Angeles, Orange and Ventura counties	90	96	38	33	6,994	1,321	1,159	858	1,680
R. E. Collom, Santa Maria, Cal.—Santa Barbara, San Luis Obispo and Santa Clara counties	98	88	39	21	10,660	362	393	246	2,250
R. N. Ferguson, Taft, Cal.—Kern County	638	629	360	99	56,122	4,246	4,406	1,098	6,500
R. D. Bush, Coalinga, Cal.—Fresno County	114	155	245	47	12,703	944	1,265	297	2,570
	940	938	682	200	86,479	6,873	7,223	2,499	13,000

Additions to the technical staff have made it possible to make considerable advance in solving the problems before us. The work is, however, far from completed. The percentage of completion is to some extent indicated by comparison of the number of graphic logs with the number of producing wells. Another indication is furnished by comparison of figures for proved acreage and models.

Attention is again called to the fact that operators must give considerable attention to the technical details of their own operations, and can not expect this department to provide all plans for development and repair.

The reports by the various deputies have necessarily been so condensed as to omit much information of general interest, as it was impossible to carry on our regular work and at the same time write a complete and detailed statement of it. It is believed, however, that enough information is given so that interested readers will be given a clue for any further inquiries.

The supervisor has at all times had the active co-operation of all the deputies, without which it would be impossible to conduct the work of the department. The loss of two deputies during the past year was keenly felt. Mr. Chester Naramore left to accept the responsible position of Chief Petroleum Technologist of the U. S. Bureau of Mines. Mr. R. B. Moran resigned in order to again engage in the oil business as an operator.

CHAPTER II.

LOS ANGELES, ORANGE, AND VENTURA COUNTIES.

By M. J. Kirwan.

Territory.

The work assigned to this office included supervision of wells in districts Nos. 1 and 2, as prescribed in Section 10 of Chapter 718, as amended in 1917.

District No. 1 includes the counties of Los Angeles, Orange, Riverside, San Diego, Imperial and San Bernardino.

District No. 2 consists of the county of Ventura.

Organization.

The position of Deputy Supervisor was filled by Mr. Robert B. Moran, until March 15, 1917, when his resignation took effect. The present deputy assumed charge on this date, having been transferred from the Coalinga office of the department. The deputy was assisted in the work by a stenographer, whose time was divided between this department and the department of mining, and two inspectors.

GENERAL STATEMENT.

The work of this department for the fiscal year ending June 30, 1917, resulted in more detailed supervision of drilling and maintenance of oil wells than the year previous, on account of the additional assistants provided the deputy and more complete file of well records.

The following written notices were received during the past year: New wells, 128; Deepen or redrill, 40; Abandonment, 46. During this time 226 written decisions were made relative to various operations at wells. Included in this number were 129 decisions concerning operations in drilling new wells. The depth at which water should be shut off in new wells was given particular attention and recommendations covering this important feature of the work were made for each new well where there was sufficient available information. Various peg models were constructed and a number of cross sections made to aid in solving the underground problems presented to the department. The staff of assistants has been recently enlarged and the scope of this work greatly broadened.

The tables given under Districts Nos. 1 and 2 show that decisions were made for 157 tests of water shut off. A representative of the department witnessed practically every one of these tests. In some cases the tests did not prove satisfactory and recommendations were made for further tests or additional shut-offs. In most cases, the proposals to deepen or redrill received the approval of the department.

The attention of certain operators was called to the necessity of shooting sidetracked casing to prevent its acting as a conductor of water into wells redrilled to shut off water.

Detailed recommendations were made for every well abandoned, in which the depths of shooting and plugging were given.

A total of 877 graphic logs have been drawn, or 61.4% of all logs received in Districts Nos. 1 and 2. Nearly all of these logs were drawn in the San Francisco office of the department. Graphic logs are still being drawn as rapidly as possible. Prints of graphic logs were sent to operators who did not have engineering or geological departments, when decisions were made relative to abandonment work and important redrilling jobs. Cross sections were given to a number of operators to assist them in a study of underground conditions.

The data relative to production of various fields, used in compiling tables which are listed under Districts Nos. 1 and 2, was taken from monthly production reports received from various operators.

Monthly production reports are being received from all producing companies, except one, in District No. 1. Production reports have not been received regularly from all producing companies in District No. 2. In many cases the reports are of an unsatisfactory nature. In a few cases operators furnished the department with reports showing the amount and percentage of water in the oil produced by each well, after all free water had been drained off. It is obvious that such reports are of little value. Some companies make no serious effort to determine the amount of oil or water produced by individual wells for their own information, or for this department.

Plans have been made to have a representative of the department visit each producing property and discuss with the Superintendent or Manager the best and most economical means of obtaining production figures for individual wells. In some cases an estimate of the amount of oil produced and a sample of fluid from the lead line, properly tested, will give sufficient information relative to the amount of water produced. The production of certain wells do not justify the expense of providing tanks to measure the fluid production.

The following table and diagram are given to illustrate a use of production data made by this department in studying water conditions at a group of twenty-nine wells.

TABLE A.

Production Records Taken From Monthly Production Report for June, 1917:

Well No.	Barrels of clean oil	Barrels of water	Percentage of water	Number of days produced	Remarks
3	4	96	96	29	
6	28	96	77	30	
7	96	38	28	27	
9	3	0	0	1	
11	13	8	38	20	
12	2	5	71	3	
13	18	0	0	20	
14	96	46	32	30	
15	58	329	85	29	
20	181	27	12	30	
21	28	32	53	30	
22	136	174	56	30	
23	26	45	63	23	
24	130	115	47	30	
25	160	180	53	30	
26	51	290	85	27	
27	138	148	52	30	
28	65	0	0	29	
29	289	0	0	30	
30	52	25	32	30	
32	265	0	0	30	
33	68	6	8	26	
34	113	0	0	29	
35	44	2	4	28	
36	184	0	0	30	
38					Drilling
39					Drilling
40					Drilling
42					Drilling

Maps were prepared similar to that herewith shown, using symbols showing the comparative amount of water produced daily, during the month of June for each well in Districts Nos. 1 and 2. The wells shown in triangles were colored yellow, wells shown in squares colored blue and wells shown in circles colored red in order to give prominence to the different well classifications as determined by amounts of water which they produce.

A summary, showing the number and kind of notices received and decisions rendered, together with a brief statement relative to each decision, is given by section, township and range for each company, following the discussion for each field.

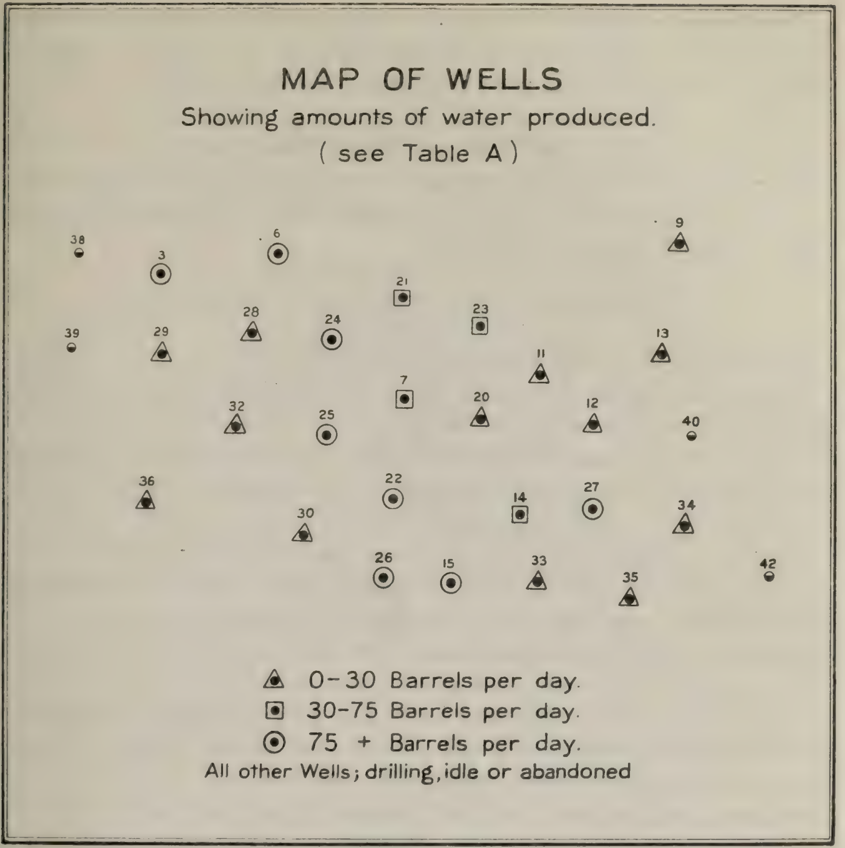

FIG. 20.

MAPS.

Thanks are due to the following individuals and companies for furnishing general field maps and maps of their properties showing well locations and other useful information.

Security Oil & Dev. Co.
County of Los Angeles Road Dept.
Pacific Light & Power Corp.
Riverside Portland Cement Co.
Petroleum Development Co.
Clara Baldwin Stocker.
General Petroleum Corporation.
San Diego Cons. Oil Co.
Union Oil Co.
Eureka Cañon Syndicate.
Rancho La Brea Oil Co.
Salt Lake Oil Co.
West Coast Oil Co.
Olinda Land Co.
Amalgamated Oil Co.
Red Star Petroleum Co.
Standard Oil Co.
Montebello Oil Co.
Central Oil Co. of Los Angeles.
Columbia Oil Producing Co.
Brea Canyon Oil Co.
R. B. Moran.
The Petrol Co.
Beatty Oil & Dev. Co.
Calumet Oil Co.
Oak Ridge Oil Co.
W. E. Barry.
Associated Oil Co.
Shell Co. of California.
Baird Oil & Asphalt Co.
White Star Oil Co.
Southern California Edison Co.

The Amalagamated Oil Company furnished this department with a copy of a geological report and oil contour map covering the property of this company in the Coyote Hills field.

LIST OF COMPLAINTS.

There were only two complaints received during the past year which required a detailed investigation by this office. A summary of work done on these complaints follows:

ANAHEIM UNION WATER COMPANY
VS.
AMALGAMATED OIL COMPANY.

During the latter part of the year 1916, the attention of this department was directed by the Anaheim Union Water Company to the serious water condition of Amalgamated Oil Company wells along the south line of the Anaheim lease, in Section 13, T. 3 S., R. 10 W., S. B. B. & M., Coyote Hills field.

The matter of this complaint was called to the attention of the Amalgamated Oil Company by this department, and request made for more complete log and history records and record of individual well production as far back as available. The company responded promptly and furnished production reports and very complete records of work done at various wells. Shortly after the receipt of this information, this department completed a number of cross sections, water and production curves, covering wells in the affected area.

Wells on the property of the Petroleum Company, adjoining, were entirely free from water until November, 1916, when Well No. 1 showed a small amount of free water and some emulsion. The water condition of this well gradually grew worse until the company proposed to shut off the top oil sand in hopes of improving the water condition of this well.

Extensive tests made by the company under the supervision of this department demonstrated that water from above the top oil sand was not entering the well. After these tests had been concluded approval was given to shut off the top oil sand. At the present time the well stands cemented.

A number of conferences were held at the Los Angeles office of the State Mining Bureau and attended by representatives of all parties concerned in the water condition on the Anaheim lease and adjoining properties. Considerable repair work has been carried on at various wells as shown by the list of decisions.

The source of the water trouble affecting certain wells in the area mentioned has not been determined. The detail structure of the eastern portion of this field has not been completely and satisfactorily worked out. Preparations have been made by this department to complete the peg model which has been constructed covering about one half of the Coyote Hills field. When this has been done, the source of water affecting certain wells on the Anaheim lease and adjoining properties, should be better known and further recommendations will be made by this department covering tests at wells, or repair work so far as conditions warrant.

BREA CANON OIL COMPANY
vs.
BIRCH OIL COMPANY.

During the early part of 1917 the attention of this department was directed by the Brea Cañon Oil Company to the increase in water in their wells along the west line of their property in Section 2, T. 3 S., R. 10 W., S. B. B. & M. The Brea Cañon Oil Company expressed the opinion that this increase in water resulted from the water condition of Birch Oil Company wells, adjoining on the west.

An investigation by this department showed that water conditions in a number of wells in the western part of the Brea Cañon field were serious, and that some of the affected wells in this area probably produce large amounts of water from formations penetrated near the bottom of these wells.

Tables showing the production of Brea Cañon Oil Company wells along the western side of their property were made and showed that there was a slight increase in the amount of water produced by Well No. 27. During February, 1917, this well averaged 23 barrels of water per day, which was the largest amount of water produced per day by any wells of the Brea Cañon Oil Company, located on the western side of their property. Well No. 10 of the Birch Oil Company was completed and commenced pumping March 6, 1917, after which date the water content of fluid produced by Brea Cañon Well No. 27 decreased until in June it averaged less than 5 barrels of water per day. It appears that drilling water from Birch Well No. 10 probably entered Brea Cañon Well No. 27. The water condition of the latter well is now considered satisfactory by the Brea Cañon Oil Company.

LEGAL ACTION TAKEN BY THE DEPARTMENT.

The Providential Oil Company, operating in Section 19, T. 3 S., R. 9 W., S. B. B. & M., Coyote Hills field, failed to file log records and monthly production reports of their producing wells and notices relative to two wells which were drilling. A number of requests were made for these records and various blanks providing space for information required sent to officials of the company. After waiting for over a year, a formal demand for records and notices was made upon the company, but they failed to reply or file any records. Finally it became necessary for the State Oil and Gas Supervisor to take action against the company for their failure to comply with the law.

On May 10, 1917, the deputy supervisor swore to a criminal complaint and, after summons had been served upon the company, they immediately filed the required records with this department.

After the records had been filed, a request was made by this department to the Prosecuting Attorney of the city of Los Angeles to dismiss the complaint. This was done, because it has been the aim of this department to act in an advisory rather than a prosecuting capacity.

The management of the Providential Oil Company recently changed hands and the new officials are actively co-operating with this office in the matter of protecting the oil bearing formations on this property from water.

DISTRICT No. 1.

The entire production of oil in this district was obtained from Los Angeles and Orange counties.

The name Whittier-Fullerton oil fields follows common usage to include all the fields east of the city of Los Angeles; namely, Olinda, Brea Cañon, Whittier, Coyote Hills, Montebello and Puente.

The number of wells in this district, number of producing wells, number of logs filed, number of graphic logs, average daily production of oil and water, percentage of water, number of acres of proved oil land, is shown by fields in the following tabulation:

TABLE 1.

Field	Wells listed	Logs filed	Graphic logs	Number of wells accounted for by production reports	Number of wells actually producing, according to production reports	Average daily production		Average daily production per producing well		Percentage of water
						Barrels oil	Barrels water	Barrels oil	Barrels water	
Coyote Hills	221	215	204	171	161	26,285	2,631	163	16	9.1
Olinda	348	224	206	266	251	7,598	926	30	3.7	10.8
Brea Canyon	89	72	67	66	62	4,717	2,032	76	33	30.1
Puente	85	3	0	44	44	62	4	1.4	0.1	6.0
Whittier	244	211	193	150	139	3,222	2,624	23	19	44.9
Montebello	3	3	3	2	2	852	0	426	0	0.0
Salt Lake	417	394	185	272	243	3,436	2,186	14	9	38.8
Newhall	200	32	0	76	75	362	325	5	4	47.3
Miscellaneous	5	5	0	0	-------	-------	-------	-------	-------	------
Totals	1,612	1,159	858	1,047	977	46,534	10,728	47.6	11	18.8

The following table gives a summary of written notices received and decisions made in this district during the past year:

District No. 1—Field	New wells		Test of water shut off		Deepen or redrill		Abandon	
	Notices	Decisions	Notices	Decisions	Notices	Decisions	Notices	Decisions
Coyote Hills	36	38	59	48	17	19	18	17
Olinda	18	18	12	18	2	2	1	1
Brea Canyon	2	2	3	2	2	3	------	------
Whittier	9	8	17	13	8	8	1	1
Montebello	11	9	2	2	------	------	------	------
Salt Lake	4	1	2	1	4	3	4	4
Newhall	4	4	9	10	------	------	4	4
Miscellaneous	6	6	4	2	2	3	5	6
Totals	90	86	108	96	35	38	33	33

COYOTE HILLS FIELD.

In the recent classification of oil field names, the fields sometimes referred to as East Coyote and West Coyote, are now called Coyote Hills field by the State Mining Bureau.

GEOLOGY.

In general the surface contour of the Coyote Hills indicates the geological structure of these hills. The structure of both hills is anticlinal.

Study of peg model constructed of the western range of hills, including Sections 17, 18, 19, 20, and the western portions of Sections 16 and 21, T. 3 S., R. 10 W., and Sections 13 and 24, T. 3 S., R. 11 W., indicates that the underground structure conforms to a marked degree with the surface structure. The geology of this portion of the Coyote Hills as described in Bulletins Nos. 63, 69 and 73 of the State Mining Bureau, in which the underground structure of the field was forecast from evidences of surface outcrops, has been borne out by study of the well records, detailed cross sections and a complete peg model, constructed by this department during the past year.

A contour of the top of the producing oil zone, as shown by the peg model, is a dome with an elongated axis in an approximate east and west direction, the apex of the dome being in the S. W. ¼ of Section 18, T. 3 S., R. 10 W. The anticline plunges gradually east and west from this point, and the dip of the flanks appears to be greater than the plunge of the axis.

Recent wells completed and producing near the apex of the fold and on the south flank of the anticline (in the N. ½ of Sec. 19, T. 3 S., R. 10 W.) are prolific producers. The depth to which these wells have been drilled into the oil bearing formations, and the proximity to the apex of the dome probably accounts for the large production of these wells.

Only a small part of the eastern portion of the Coyote Hills field has been covered by a peg model made by this department.

Surface geology of this portion of the field has been described in detail in publications of the State Mining Bureau, mentioned above, and in various reports made by geologists in the employ of private companies operating in this field.

A difference of opinion still exists as to the correct correlation of the oil horizons. The completion of the peg model which is under construction by this department no doubt will aid in solving this problem. The logs of seven wells located in the eastern part of Sec. 23, T. 3 S., R. 10 W., and along the west line of Sec. 24, T. 3 S., R. 10 W., show an upper oil zone. This zone is worth protecting from water as a number of these wells produce a considerable quantity of oil. One of these wells was recently completed and produces at the rate of about 600 bbls. of oil per day from this zone only. The production of other wells in this area comes from a second zone, which probably is the main source of production in the eastern portion of the Coyote Hills.

SUMMARY OF WATER CONDITIONS.

Study of monthly production reports for June, and map prepared showing relative amounts of water produced by individual wells, shows that 161 wells produced during this month. Of this number, 134 wells produced from 0 to 20 barrels of water per day, making a total of 19,651 barrels of water, or an average of 5 barrels per day. Ten wells produced from 20 to 40 barrels of water per day each, making a total of 8,657 barrels, or an average daily production of 29 barrels of water. Seventeen wells produced a total of 50,623 barrels, or an average of 99.3 barrels of water per day each. The foregoing record of production shows that the water conditions are not very serious.

Most of the wells producing more than 40 barrels of water per day are on the edge of producing territory. There is a difference of opinion as to whether or not the majority of these wells produce "edge water," or water that has not been properly shut off. Nine of the wells producing more than 40 barrels of water each per day, are located in the southern half of Section 13 and the northern half of Section 24, T. 3 S., R. 10 W. The remaining wells are distributed throughout the field along the edge of the producing territory. One well in this field averaged over 11,000 barrels per month, and steps have been taken by the owner to shut off water in this well. Several wells producing large amounts of water will probably be repaired or abandoned during the coming year.

There are comparatively few wells shut down on account of their water condition. It has been the general policy of operators in this field to abandon and plug wells which produce large quantities of water after determining that it would not be profitable to attempt to shut off the water in order to make them produce clean oil.

A number of wells have been recently abandoned in the southeastern part of the field on account of small production of oil. Many of the wells in this area produce an emulsion from which it is difficult to separate the oil. The fluid levels in nearly all of these wells stand low enough to indicate that water above the oil sands is shut off and that the water produced comes through the oil bearing formation from an undetermined source.

FUTURE DEVELOPMENTS.

The limits of the productive area from present producing zones of this field have been fairly well defined. There has been considerable development work in the western portion of the field and no doubt the present proved area will be extended by future wells drilled.

The abandonment of a number of wells in the southeastern part of the field on account of small production of oil indicates that it would not be profitable to drill new wells in this area, to produce from formations penetrated by present wells. A deep test well in the eastern part of this field may possibly show that productive formations underlie the present producing zones.

Following is a summary of all decisions rendered and notices received by the department during the past year. This tabulation gives a list of various companies and the sections in which active development or repair work was carried out.

Section	Township	Range	Company	New wells		Test of water shut off		Deepen or redrill		Abandon	
				Notices	Decisions	Notices	Decisions	Notices	Decisions	Notices	Decisions
17	3 S	9 W	St. Hel. Pet.	------	------	------	------	------	------	1	1
17	3 S	9 W	Quintuple Oil	------	------	1	1	------	------	------	------
17	3 S	9 W	Union Oil	------	------	1	1	------	------	------	------
18	3 S	9 W	Union Oil	4	4	3	3	------	------	3	3
18	3 S	9 W	St. Hel. Pet.	------	------	------	------	2	2	------	------
18	3 S	9 W	Standard	------	------	------	------	------	------	1	1
19	3 S	9 W	Fetterman	------	------	------	------	2	2	1	1
19	3 S	9 W	Standard	------	------	------	------	------	------	1	1
19	3 S	9 W	S. D. Consol.	------	------	------	------	2	1	------	------
19	3 S	9 W	Calokla	------	------	------	------	------	------	2	3
19	3 S	9 W	Prov. Oil	------	2	1	1	------	------	------	------
19	3 S	9 W	Fullerton Gr. West	------	------	------	------	1	1	------	------
20	3 S	9 W	Standard	------	------	2	------	------	------	1	1
20	3 S	9 W	Quintuple	------	------	------	------	------	------	1	1
24	3 S	9 W	Yorba Oil	------	------	------	------	------	------	1	------
29	3 S	9 W	Union	1	1	------	------	------	------	------	------
8	3 S	10 W	Tri-State	------	2	------	------	------	------	------	------
13	3 S	10 W	Amalgamated	1	1	2	2	4	5	------	------
13	3 S	10 W	Union	------	------	1	1	------	------	------	------
17	3 S	10 W	Standard	1	1	2	2	------	------	------	------
18	3 S	10 W	Standard	5	3	6	6	1	1	------	------
19	3 S	10 W	Standard	4	4	2	2	------	------	------	------
22	3 S	10 W	Union	------	1	------	------	------	------	------	2
22	3 S	10 W	Standard	1	1	------	1	------	------	2	2
23	3 S	10 W	Union Oil	5	6	11	12	1	1	2	------
23	3 S	10 W	Amalgamated	3	3	5	5	1	2	------	------
24	3 S	10 W	Amalgamated	2	1	1	1	------	------	------	------
24	3 S	10 W	The Petroleum	------	------	3	------	------	1	------	------
28	3 S	10 W	Union Oil	1	1	------	------	------	------	------	------
4	3 S	11 W	Union Oil	1	1	------	------	------	------	------	------
13	3 S	11 W	Standard	2	2	5	4	3	3	1	1
24	3 S	11 W	Standard	5	4	13	6	------	------	1	------
			Totals	36	38	59	48	17	19	18	17

Following is a list of decisions rendered covering operations at wells in this field for the past year, accompanied by a brief description showing character of work done at each well included in the list and recommendations made by this department.

DECISIONS.

T. 3 S., R. 9 W., S. B. B. & M.

SECTION 17.

St. Helens Petroleum Co., Ltd.

Well No. 1, abandon. CC-299.

Plan of proposed abandonment as submitted by company was approved as satisfactory.

Quintuple Oil Co.

Well No. 2, shut-off. C-70.

Test showed that water was satisfactorily shut off.

Union Oil Co.

Well No. 2, Berkenstock, shut-off. C-185.

The results of test showed that a small amount of water entered the well while standing for test. Approval to resume drilling was given, contingent upon a production test after completion.

SECTION 18.

Union Oil Co.

Well G. & L. No. 12, abandon. CC-312.

Water string collapsed about 430′ above shut-off point.

Approved proposal to plug with cement about 50′ below point of collapse. Recommended that company leave sufficient casing in well to act as a conductor to a depth of about 2450′ in order that the well might be re-entered in case future developments indicate the necessity of further plugging.

Well G. & L. No. 29, abandon. CC-142.

Approved proposal to abandon, recommending shooting instead of ripping, in order to plug with cement at depths indicated in abandonment proposal.

Well G. & L. No. 35, abandon. CC-141.

Proposed method of plugging and abandoning approved.

Well G. & L. No. 36, shut-off. C-55.

On account of the well making considerable gas when first completed, it was impossible to make a bailing test, and a production test was taken thirty days after completion. The test showed well making 165 bbls. per day, of which 3% was water.

Well G. & L. No. 39, begin drilling. CC-118.

Approved proposed estimate of depth of water shut off.

Well G. & L. No. 39, shut-off. C-107.

Test satisfactory.

Well G. & L. No. 40, begin drilling. CC-119.

Approved proposed estimate of water shut-off.

Well G. & L. No. 40, shut-off. C-79.

Test of water shut off approved.

Well G. & L. No. 41, begin drilling. CC-120.

Estimated depth of water shut off approved.

Well G. & L. No. 42, begin drilling. CC-297.

Estimated depth of water shut off approved.

St. Helens Petroleum Co., Ltd.

Well No. 2 (Johnson), redrill. CC-256.

Approved proposal to remove upper portion of oil string.

Well No. 3 (Johnson), redrill. CC-270.

Approved proposal to remove upper portion of oil string.

Standard Oil Co.

Well (Robertson) No. 6, abandon. CC-116.

The proposed method of abandonment was approved.

SECTION 19.

The Fetterman Oil Co.

Well No. 1, redrill. CC-285.

Approved proposal to remove upper portion of oil string.

Well No. 3, redrill. CC-292.

Approved proposal to remove upper portion of oil string.

Standard Oil Co.

Well No. 1, Lemke, abandon. CC-206.

Approved proposal to abandon indicating depths at which shooting and plugging should be done.

San Diego Consolidated Oil Co.

Well No. 4, redrill. CC-306.

Approved proposed method of redrilling to shut off water.

Calokla Oil Co.

Well No. 1, Lehmer, abandon. CC-255.

Recommended shooting and plugging with cement between certain depths and that company determine that each plug be set properly.

Well No. 2, Lehmer, abandon. CC-268.

Approved abandonment proposal indicating depths at which shooting and plugging should be done. Recommended that company determine that each cement plug set properly.

Providential Oil Co.

Well No. 4, commence drilling. CC-277.

Approved proposal of the company to shut off water at a depth of about 2900′. Drilling was commenced at this well on about January 1, 1916. The company filed notice of intention to commence drilling on May 14, 1917, after legal action had been taken by this department against the company for failure to file certain records.

Well No. 4, shut-off. C-172.

Test of water shut off approved.

Calokla Oil Co.

Well No. 2, Lehmer, abandon. CC-323.

Approved proposal to shoot 10″ casing at a depth of 1500′ instead of a depth of 2000′ as formerly proposed. Plugging of lower portions of well had been completed as recommended in decision CC-268.

Providential Oil Co.

Well No. 5, commence drilling. CC-276.

Estimated depth of water shut off approved.

The Fetterman Oil Co.

Well No. 2, abandon. CC-300.

Approved proposal to abandon. Recommended shooting and plugging with cement, between certain depths.

Fullerton Great West Oil Co.

Well No. 3, redrill. CC-309.

After making a peg model of the field, including this property, it was found that the water string in this well had been carried through the top oil zone and cemented about 500′ lower than it should have been cemented. The water string failed to shut off water and the well was finished through the lower oil zone without having the water shut off. The company proposed to redrill this well and make an effective shut off at the proper depth, plugging the bottom of the well before redrilling to protect oil formations from water. This proposal was approved by this department.

SECTION 20.

Standard Oil Co.

Well No. 2, Coyote, abandon. CC-205.

Proposed method of abandonment approved.

Quintuple Oil Co.

Well No. 3, abandon. CC-267.

Approved proposal to abandon. Recommended shooting and plugging between certain depths and that the company determine that each cement plug be set properly.

SECTION 29.

Union Oil Co.

Well No. 1, Chapman, commence drilling. CC-316.

Recommended that company cement each string of casing landed above oil-bearing formations which may be encountered on account of this being a "wild cat" well.

T. 3 S., R. 10 W., S. B. B. & M.

SECTION 8.

Tri-State Oil Co.

Well No. 1, continue drilling. CC-213.

Recommended that the company file additional information relative to results of tests of water shut off which the company made without notifying this department.

Well No. 1, continue drilling. CC-252.

The company filed affidavit that water was successfully shut off at a depth of 4243′. Further information received from the company showed that water was bailed to a depth of 1300′ and raised 500′ while standing 24 hours. This decision stated that shut-off attempted at 4243′ was not effective in shutting off water, and the test was, therefore, unsatisfactory.

SECTION 13.

Amalgamated Oil Co.

Well No. 6, Anaheim, shut-off. C-76.

The well was redrilled, sidetracking lower portion of original water string which had collapsed. The results of the test showed that new water string shut off water although water might possibly enter oil sand through original hole, which had not been plugged.

Well No. 10, Anaheim, redrill. CC-262.

Recommended that the company defer the proposed work of testing water string and plugging bottom of well, awaiting results of work in plugging bottom of adjoining well.

Well No. 12, redrill. CC-271.

Approved proposal to plug bottom of well in order to shut off possible bottom water.

Well No. 14, Anaheim, redrill. CC-242.

Recommended that the company defer work of testing water string and plugging bottom of well pending conference which had been arranged between the company, the owners of the land and neighboring companies.

Well No. 14, Anaheim, redrill. CC-261.

At conference arranged by this department and attended by representative of the company, owner of the land and neighbors, it was decided that it would be advisable to delay proposed work pending results of work done in plugging bottom of adjoining well.

Well No. 28, Anaheim, redrill. CC-241.

Approved proposal to replug bottom of well.

Well No. 30, Anaheim, begin drilling. CC-155.

Approved proposed estimated depth of water shut off.

Well No. 30, Anaheim, shut-off. C-118.

Test of water shut off satisfactory.

Union Oil Co.

No. 38, G. & L., shut-off. C-69.

Test of water shut off approved.

SECTION 17.

Standard Oil Co.

Well No. 19, M-C, shut-off. C-65.

The first shut-off was made with 8¼″ casing at 3415′. The well made about 7,000,000 feet of gas per day, when tested. This casing collapsed and water was subsequently shut off with 6¼″ casing at a lower depth.

Well No. 23, M-C, shut-off. C-149.

Test of water shut off satisfactory.

Well No. 31, M-C, drill. CC-278.

Approved proposed depth of water shut-off.

SECTION 18.

Standard Oil Co.

Well No. 15, Murphy-Coyote, redrill. CC-295.

Approved proposal to plug oil string below shoe of water string; cut off and pull out oil string above top of plug; put perforated die nipple on bottom of new oil string in order to screw on to casing left in the well and pump cement through the die nipple in order to shut off the top water. At this date tests have not been made to show results of this interesting mechanical operation.

Well No. 21, Murphy-Coyote, shut-off. C-116.

Test of water shut off satisfactory.

Well No. 24, Murphy-Coyote, shut-off. C-80.

Test of water shut off satisfactory.

Well No. 25, shut-off. C-77.

Company made test of water shut off without notifying this department to witness same. The results of the test indicated that water was shut off.

Well No. 28, Murphy-Coyote, commence drilling. CC-223.

Approved proposed depth of water shut off.

Well No. 28, Murphy-Coyote, shut-off. C-165.

Test of water shut off satisfactory.

Well No. 29, Murphy-Coyote, drill. CC-182.

Approved proposed depth of water shut off.

Well No. 29, Murphy-Coyote, shut-off. C-180.

The results of the test indicated that 8¼″ casing did not shut off water. Recommended that plug be put in below shoe of water string in order to determine, if possible, the source of water which entered the well.

Well No. 29, Murphy-Coyote, shut-off. C-186.

Recommended that attempt be made to force cement behind the water string, or deepen well, only through sand encountered, below water string, and pump or bail well for further tests.

Well No. 30, Murphy-Coyote, commence drilling. CC-272.

Proposed depth of water shut off approved.

SECTION 19.

Standard Oil Co.

Well No. 26, drill. CC-149.

Approved estimated depth of water shut off.

Well No. 26, shut-off. C-147.

A production test, after completion of the well, was recommended on account of the bailer having been run several times previous to the arrival of the inspector to witness test.

Well No. 27, drill. CC-150.

Approved proposed depth of water shut off.

Well No. 27, M. C., shut-off. C-183.

A production test was recommended after completion of the well on account of a difference in casing and sand line measurements as a result of which it was not definitely established that bailer went below shoe of water string.

Standard Oil Co.
Well No. 32, commence drilling. CC-263.
Proposed depth of water shut off approved.
Well No. 33, commence drilling. CC-303.
Proposed depth of water shut off approved.

SECTION 22.

Union Oil Co.
Well No. 1, Toussou, abandon. CC-127.
Approved proposed method of abandonment.
Well No. 3, San Juan, abandon. CC-128.
Approved proposed method of abandonment.
Well No. 17, drill. CC-198.
Recommended that water be shut off about 270′ deeper than proposed by company.

Standard Oil Co.
Well No. 6, Coyote No. 2, abandon. CC-207.
Approved proposal to abandon and indicating the depths at which shooting and plugging should be done.
Well No. 7, Coyote No. 2, abandon. CC-169.
Approved proposal to abandon and indicating depths at which plugging should be done.
Well No. 8, Coyote No. 2, shut-off. C-59.
Test of water shut off approved.
Well No. 9, Coyote No. 2, drill. CC-214.
Approved proposed depth at which water should be shut off.

SECTION 23.

Union Oil Co.
(Hole) No. 6, redrill. CC-164.
Approved proposal to redrill and deepen.
(Hole) No. 8, shut-off. C-60.
Test of water shut off satisfactory. Water was shut off several hundred feet above productive zone in adjoining wells in order to test upper formations.
(Hole) No. 8, shut-off. C-187.
Approved proposal to continue drilling after test of water shut-off was witnessed. Recommended production test after completion on account of water level having been found 73′ below bailing depth reported.
(Hole) No. 9, shut-off. C-82.
Test of shut off satisfactory.
(Hole) No. 9, re-cement. CC-244.
Approved proposal to cement below original point of shut off, after holding conference with representatives of company and adjoining operator.
(Hole) No. 9, shut-off. C-164.
Test of water shut off approved.
(Hole) No. 10, shut-off. C-61.
Test of water shut off approved.
(Hole) No. 11, shut-off. C-64.
Test of water shut off satisfactory.
(Hole) No. 11, shut-off. C-81.
Test of water shut off satisfactory.
(Hole) No. 11, shut-off. C-150.
A letter from the company stated that a sand carrying heavy oil and possibly some water was shut off on account of results obtained in well No. 9, adjoining. The test showed that water was not passing to levels in the well below the point of shut off. Attention of the company was directed to the fact that proposal to shut off upper oil-bearing formations was not received by this department.

Union Oil Co.

No. 11, continue drilling. CC-245.

Approved proposal to continue drilling after holding conference with adjoining operator relative to matter of protection from water of oil-bearing formations which had been shut off.

(Hole) No. 12, shut-off. C-97.

Test of water shut off satisfactory.

(Hole) No. 13, shut-off. C-153.

Test of water shut off satisfactory.

(Hole) No. 14, drill new. CC-143.

Recommend water shut off at a depth of about 3000′.

(Hole) No. 14, shut-off. C-158.

Test of water shut off approved.

(Hole) No. 15, drill. CC-196.

Recommended that company shut off water about 100′ lower than proposed in notice of intention to commence drilling.

(Hole) No. 16, drill. CC-195.

Recommended that company shut off water about 100′ lower than proposed in notice of intention to commence drilling.

(Hole) No. 18, drill. CC-159.

Approved proposed depth of water shut off.

(Hole) No. 18, shut-off. C-146.

Test of water shut off approved, although water was found 29′ below reported bailing depth.

Amalgamated Oil Co.

Well No. 2, Hualde, drill. CC-288.

Recommended that company shut off water above upper oil zone in case it was encountered at this well.

Well No. 8, Hualde, shut-off. C-74.

Test of water shut off satisfactory.

Well No. 10, Hualde, shut-off. C-73.

Test showed that water was not completely shut off. Recommended another shut off at a lower depth.

Well No. 9, Hualde, drill. CC-154.

Approved proposed depth of water shut off.

Well No. 9, Hualde, shut off. C-113.

Test of water shut off satisfactory.

Well No. 9, redrill. CC-211.

Water entered the well subsequent to test of water shut off, and well was shot about 150′ above the point of shut-off in order to remove oil string and an 8′ plug of lead, wool and iron shavings put in. Approved proposal to shoot and replug well with cement; move derrick and drill new hole. Recommended that company leave conductor casing in well in order that it may be re-entered and additional plugging done if deemed advisable, judging from results at adjoining wells.

Well No. 9, Hualde, remove derrick and redrill. CC-335.

The company submitted a detailed record of work done in shooting and plugging. Approval to move derrick and drill new hole was given.

Well No. 23, Hualde, shut-off. C-91.

Test of water shut off approved.

Well No. 26, Hualde, drill. CC-172.

Recommended that company shut off water about 50′ lower than proposed.

Well No. 26, Hualde, shut-off. C-141.

Test of water shut off approved.

SECTION 24.

Amalgamated Oil Co.

Well No. 40, Anaheim, shut-off. C-87.

Test of water shut off approved.

Amalgamated Oil Co.

Well No. 56, Anaheim, drill. CC-289.

Recommend that company shut off water above an upper oil zone which probably would be encountered in this well and which had been encountered in certain adjoining wells.

The Petroleum Co.

Well No. 1, Gilman, redrill. CC-239.

Approved proposal to set a packer in order to test for possible "top" water.

SECTION 28.

Union Oil Co.

Well No. 6, Bastanchury, drill. CC-122.

Approved depth of water shut-off proposed by company, stating that another and lower shut-off would probably be necessary.

T. 3 S., R. 11 W., S. B. B. & M.

SECTION 4.

Union Oil Co.

Well No. 3, Myer, drill. CC-216.

Approved the estimates received from the company relative to depth of water shut off. This well is located over three miles from the nearest producing well and the depth at which oil-bearing formation may be encountered is unknown.

SECTION 13.

Standard Oil Co.

Well No. 2, redrill. CC-170.

Approved proposal to redrill in order to shut off water.

Well No. 2, Emery, shut-off. C-131.

The results of the test showed water which was probably return drilling water, would enter if well was bailed below a depth of 2350′. Recommended production test be made 90 days after completion of redrilling work. Production reports show that the well produced 0.1% water in June, 1917, indicating a satisfactory shut-off.

Well No. 5, redrill. CC-212.

Approved proposal to remove oil string and attempt to force cement behind the water string, to shut off water.

Well No. 5 Emery, shut-off. C-159.

Test of water shut off showed that water was not descending into the well from above the shut-off point and was approved.

Well No. 5 Emery, redrill. CC-336.

The company proposed to plug the bottom of well up into the water string and perforate the water string to test oil-bearing formations formerly shut off. Recommendations were made by this department to plug the bottom of the well by stages in order, if possible, to locate the source of the water. Approved proposal to perforate water string and test the well after bottom of well had been plugged.

Well No. 13, abandon. CC-174.

Recommended shooting and plugging at certain specified depths.

Well No. 27, drill. CC-117.

Approved proposed estimated depth for shutting off water.

Well No. 27 Emery, shut-off. C-104.

Test of water shut off approved.

Well No. 28, drill. CC-152.

Proposed depth of water shut off satisfactory. .

Well No. 28 Emery, shut-off. C-123.

Test of water shut off satisfactory.

SECTION 24.

Standard Oil Co.

Well No. 5, McNally, shut-off. C-108.

Test of water shut off approved.

Well No. 26, shut-off. C-68.

Test of shut off approved.

Well No. 29, drill. CC-151.

Approved proposal depth of shutting off water.

Well No. 29, Emery, shut-off. C-142.

Test of shut off approved.

Well No. 30, drill. CC-148.

Approved proposal depth for shutting off water.

Well No. 30, Emery, shut-off. C-122.

Test of water shut off approved.

Well No. 31, Emery, shut-off. C-173.

The results of the test showed that water from above the shut-off point was not passing to lower levels in the well.

Well No. 32, test water string. CC-296.

Approved proposal from company to try for circulation and pump cement back of water string. Recommended that company test water string by plugging well with cement below the shoe of this casing. Attention of company was called to their failure to notify the department relative to depth at which water string was to be cemented.

Well No. 32, Emery, shut-off. C-189.

The results of the test witnessed by a member of the department showed that water was not shut off. Approved proposal from company to again try and force cement back of water string.

Well No. 33, drill. CC-283.

The estimated depth for shutting off water, proposed by the company, was approved.

OLINDA FIELD.

This field takes its name from the oil town of Olinda, located on the A. T. & S. F. Ry. in Section 9, T. 3 S., R. 9 W., S. B. B. & M. It includes all of Sections 3, 4, 5, 6, 7, 8, 9, and 10 and north half of Sections 16 and 17, T. 3 S., R. 9 W., and the S. E. ¼ of Sec. 1, and all of Sec. 12, T. 3 S., R. 10 W. The producing wells in general follow a line of foothills parallel to the La Habra Valley on the north at its eastern extremity.

GENERAL GEOLOGY.

The structure of the Olinda field is very similar to the structure of the Whittier field. The Fernando formation rising out of the La Habra Valley attains an elevation of about 250′ above the floor of the valley, then plunges into the fault zone developed along the contact of Fernando and Monterey formations.

Study of a peg model and cross sections made by this department of a portion of the field shows a dip of 34° S. 23° W. in the SW. ¼ of Section 8, T. 3 S., R. 9 W.

Two distinct oil horizons have been penetrated by drilling in this field. The upper zone is associated with conglomerate beds which probably mark the base of the Fernando. The lower zone is encountered at a distance of about 700-800 ft. below the top of the upper zone and the oil-bearing formations probably are of Puente or Monterey age. The gravity of the oil produced from the two zones varies with the depth at which the zones are encountered, the oil produced from the lower zone being lighter in gravity than oil from the upper zone at the same location.

Wells down the dip in the southern part of Section 8, T. 3 S., R. 9 W., produce from the upper zone only, while wells near the center of Section 8 produce from both upper and lower zones, and wells in the north half of this section near the outcrop of the upper zone, where the oil is heavy, produce mainly from the lower zone.

The general dip of the formations south and west brings the conglomerate oil zone to the surface in outcrop on the south flank of the anticline in the N. W. ¼ of Sec. 8, T. 3 S., R. 9 W. The outcrop is evidenced by numerous seepages.

The rise of formations toward the east, and the faulting near the center of Sec. 9, T. 3 S., R. 9 W., have combined to raise an oil horizon which is probably stratagraphically lower than the lowest horizon from which wells are producing to the west, possibly accounting for the lighter gravity of oil produced by wells in this vicinity.

The further rise of oil-bearing formations toward the east and the subsequent erosion and exposure of these formations, define the limits of production on the eastern extension of this field.

The Olinda field adjoins and is a natural extension of the Brea Cañon field to the west.

PRODUCTION AND WATER CONDITIONS.

There are 251 producing wells in this field which, according to Table No. 1, produced 7,598 bbls. of oil and 926 bbls. of water per day during the month of June, 1917, or a daily average of 30 bbls. of oil and 3.7 bbls. of water per well day. This table shows that the amount of water produced during the month of June amounted to 10.8% of the total amount of fluid produced by these wells.

Monthly production reports for June and map prepared showing relative amounts of water produced by individual wells show that 14 wells produced daily a total of 574 bbls. of water, or more than one-half of the amount of water produced by the field. The remaining 237 wells produced 352 bbls. of water, or an average of 1½ bbls. of water per day.

It has been the practice of some of the companies in this field to drain off all free water from receiving tanks at the wells and furnish this department with a record of the amount and percentage of water remaining in the oil after this has been done. One company in this field has recently changed their system of funishing production reports after it had been pointed out by this department that the former method of reporting amount and percentage of water for each well was incorrect.

No doubt the amount and percentage of water shown by our tabulations will be greatly increased when all companies in this field have furnished this department with correct production reports showing the total amount of water produced by various wells.

SUMMARY OF NOTICES AND DECISIONS.

Following is a summary of notices received and decisions rendered by this department for the Olinda field during the past year. Reference to this table shows that most of the development in this field was carried on by the Petroleum Development, West Coast and Union Oil companies, and relates primarily to the drilling of new wells.

Section	Township	Range	Company	New wells		Test of water shut off		Deepen or redrill		Abandon	
				Notices	Decisions	Notices	Decisions	Notices	Decisions	Notices	Decisions
7	3	9	Union	1	1	------	------	------	------	------	------
8	3	9	Pet. Dev.	5	6	4	7	1	1	------	------
8	3	9	West Coast	6	6	3	6	1	1	------	------
8	3	9	Union	4	4	------	------	------	------	------	------
8	3	9	Col. Oil Pro.	2	1	2	2	------	------	------	------
8	3	9	Olinda Land	------	------	1	1	------	------	------	------
16	3	9	Olinda Land	------	------	1	1	------	------	------	------
17	3	9	Union	------	------	1	1	------	------	------	------
24	3	9	Yorba Oil	------	------	------	------	------	------	1	1
			Totals	18	18	12	18	2	2	1	1

NEW DEVELOPMENTS.

During the fiscal year drilling was commenced at 16 new wells, two wells were redrilled and one well abandoned in the Olinda field.

There are now approximately 1541 acres of proven oil land in this field. Proven territory has been recently extended some distance to the south by the completion of Union Oil Co. "G. & L." Well No. 50, which is located along the north line in the N. W. ¼ of Sec. 17, T. 3 S., R. 9 W.

Following is a list of all decisions rendered covering operations at wells in this field for the past year, accompanied by brief descriptions showing the character of work done at each well included in the list, and recommendations made by this department.

DECISIONS.

T. 3 S., R. 9 W., S. B. B. & M.

SECTION 7.

Union Oil Co.

Well No. 8, Naranjal, drill. CC-145.

The company proposed to shut off water at a depth of about 2400′. Recommendation was made by this department to shut off at a depth of 2850′.

SECTION 8.

Petroleum Development Co.

Well No. 24, shut-off. C-72.

This well was deepened, after which production test was witnessed and approved as satisfactory.

Well No. 26, shut-off. C-98.

Production test thirty days after well had been deepened showed a cut of 3% water in 30 barrels of fluid. Test approved.

Well No. 31, shut-off. C-56.

Production test made after well had been depeened. Test approved as satisfactorily showing that well made no water.

Well No. 47, deepen. CC-266.

Approved proposal to deepen well from 2415′ to about 3000′. The results of this work increased the production about 1000 bbls. of oil per month.

Well No. 74, shut-off. C-133.

The 12½″ casing did not completely shut off the water. The 10″ casing was landed at a depth of 1607′. Department not notified for test of shut off with this casing. Letter received from company giving results of test of 12½″ casing. Recommended production test 90 days after completion of the well.

Well No. 75, commence drilling. CC-113.

The company expected to encounter water between 700 and 800′. Recommended that the company watch formations carefully and shut off water when found.

Well No. 76, begin drilling. CC-137.

Approved proposal of company to shut off water at a depth of about 800′.

Well No. 76, shut-off. C-132.

Written notice of test of water shut-off not received; however, test was witnessed by a member of this department and approval given to continue drilling.

Well No. 77, drill. CC-162.

Recommended that company shut off water at the depth proposed in the notice of intention to commence drilling.

Well No. 77, shut-off. C-148.

Test of shut off approved as satisfactory.

Well No. 78, drill. CC-199.

Approved proposal from the company to shut off water at the depth indicated in the notice of intention to commence drilling.

Well No. 78, shut-off. C-168.

Test of water shut off approved.

Well No. 79, commence drilling. CC-293.

Approved proposal from the company to shut off water at the depth indicated in the notice to commence drilling.

Well No. 80, commence drilling. CC-314.

Proposed depth of water shut off approved.

West Coast Oil Co.

Well No. 54, drill. CC-157.

Approved proposal from the company to shut off water at a depth indicated in the notice to commence drilling.

Well No. 54, shut-off. C-127.

Test of water shut off approved as satisfactory.

West Coast Oil Co.

Well No. 63, commence drilling. CC-337.

Approved proposed depth for shutting off water.

Well No. 65, shut-off. C-58.

Test showed water rising about 20″ per hour, due to casing leak. Recommended that company complete the well and shut off water with a packer.

Well No. 68, commence drilling. CC-339.

The company proposed to shut off water at a depth of about 2500′. Study of a peg model made by this department indicated that water should be shut off at about 2300′. The company was requested to furnish log of well after a depth of 2000′ had been reached in drilling, so that further study could be made regarding proper shut-off depth.

Well No. 70, shut-off. C-57.

Test showed that water was not completely shut off. Recommended test of upper oil sands, suggested probable necessity of another shut-off at a lower depth. This well was completed without making additional shut-off and since completion made an average of about 18% water.

Well No. 74, commence drilling. CC-338.

The company proposed to shut off water at a depth of 2500′ Study of peg model indicated that water should be shut off at a depth of about 2350′ in order to test the contents of the oil-bearing formations which would probably be encountered just below the latter depth.

Well No. 80, redrill. CC-158.

Approved proposal to move derrick and drill new hole. The company proposed to shut off water at a depth of 2400′. Recommended that water be shut off at depth proposed.

Well No. 80, shut-off. CC-203.

Approved proposal to drill through sand encountered at 2395′ and shut off water in suitable formation below this sand.

Well No. 80, shut-off. C-151.

Approved test of water shut off with 10″ casing cemented at 2420′.

Well No. 84, drill. CC-173.

Recommended that water be shut off at a depth of 1950′, instead of about 2500′, as proposed. Letter subsequent to this decision, confirming conference with representative of the company recommended that water string be landed at a depth of 1800′.

Well No. 84, cement. CC-230.

Approved proposal to drill into and shut off water in shale body which was expected to be encountered below conglomerate encountered at 1583′.

Well No. 84, shut-off. C-161.

Approved test of water shut off with 10″ casing cemented at 1915′.

Union Oil Co.

Well No. 6, Naranjal, drill. CC-147.

Recommended that water be shut off at about 2550′, instead of 2400′ as proposed by the company.

Well No. 6, Naranjal, cement. CC-318.

Approved proposal to continue drilling below a depth of 2640′ until a showing of oil had been encountered. This decision was made after a conference with neighboring companies.

Well No. 7, Naranjal, drill. CC-146.

Recommended that water be shut off at a depth of about 2750′ instead of 2400′ as proposed by the company.

Well No. 10, Naranjal, drill. CC-144.

Recommended that water be shut off at a depth of about 2050′ instead of 2400′ as proposed by the company.

Columbia Oil Producing Co.
  Well No. 28, shut-off. C-106.
    Test of water shut off, satisfactory.
  Well No. 29, commence drilling. CC-229.
    Notice of commencement of drilling stated that productive oil sand should be encountered at a depth of from 1200′ to 1600′ and that no water should be encountered above these depths. Recommended that this department be notified for test of water shut-off after landing casing above productive oil formations.
  Well No. 29, shut-off. C-181.
    Recommended production test thirty days after completion of well on account of results of test failing to show that hole was open or drilled below shut-off point.

Olinda Land Co.
  Well No. 17, shut-off. C-137.
    On account of slight change in water level while standing bailed for test, recommended production test 90 days after completion of well.

SECTION 16.

Olinda Land Co.
  Well No. 18, shut-off. C-94.
    The test showed that water was not shut off. Recommended cementing another string of casing at a lower depth.

SECTION 17.

Union Oil Co.
  Well No. 50, G. & L.,shut-off. C-139.
    Test satisfactory.

SECTION 24.

Yorba Oil Co.
  Well No. 2, abandon. CC-160.
    Approved proposed method of abandonment.

BREA CAÑON FIELD.

GENERAL DESCRIPTION.

Brea Cañon field takes its name from Brea Cañon, in which the pioneer wells of the field were located. Brea Cañon, as the name implies, drains a region in which are numerous oil seepages and the early wells drilled in this field followed the lines of seepage.

For the purposes of mapping and for convenience in the filing of records, the following described government subdivisions have been included in this field: The N. ½ and S. W. ¼ of Section 1, and all of Sections 2 and 3 of T. 3 S., R. 10 W., S. B. B. & M.

The geology of this field has been described in detail in Bulletin No. 309, of the U. S. Geological Survey, and in various publications of the State Mining Bureau.

PRODUCTION AND WATER CONDITIONS.

Table No. 1 shows that there were 62 wells producing during the month of June, 1917. These wells produced a total of 141,496 barrels of oil and 60,961 barrels of water during this month. Fifteen wells in this field produced a total of 57,203 bbls. of water, or 93.8% of all water produced in the field.

Bulletin No. 73, First Annual Report of this department, showed a monthly production of about 170,000 bbls. of oil and about 44,000 bbls. of water per month (for the corresponding month a year ago). This is a decrease of about 28,500 bbls. of oil and an increase of about 17,000 bbls. of water per month.

Study of monthly production report and map prepared by this department, showing the relative amounts of water produced by each well, show that serious water conditions exist in the western and the southwestern part of this field.

The general belief held by operators in this field that most of the water produced is return drilling water is not borne out by the increase of water produced, and on account of the comparatively small number of wells drilling during the past year. However, there are certain wells which are known to have been affected while adjoining wells were being drilled through the oil-bearing formations.

Well No. 12 of the Birch Oil Co., in Section 2, T. 3 S., R. 10 W., was drilled to a depth of nearly 4500′. This well was completed September 8, 1916, and produced for about nine months at a rate of about 250 bbls. of fluid per day, of which about 85% was water.

Recommendations were made by this department to the company to plug the lower portion of the well. The results of this plugging increased the production of oil about 5 bbls. and decreased the amount of water about 170 bbls. per day over the first year's average daily production. Further plugging at this well may be necessary in order to completely shut off the water.

The results obtained at this well and the beneficial results obtained from plugging the lower portion of General Petroleum Corporation's Well No. 33, located in the same section, show that a number of other deep wells in this vicinity may be benefited by a similar treatment.

Four wells in the N. E. ¼ of the N. W. ¼ of Section 2, T. 3 S., R. 10 W., averaged over 3500 bbls. of water each during the month of June, 1917. The source of water entering these wells has not been definitely determined.

One well located in the S. W. ¼ of the N. W. ¼ of Section 1, T. 2 S., R. 12 W., produced a total of 3750 bbls. of water during June, 1917.

Wells producing large amounts of water are fairly well distributed throughout the producing area of this field.

The following summary of notices received and decisions made by this department for this field during the past year shows that drilling was commenced at two new wells.

Section	Township	Range	Company	New wells		Test of water shut off		Deepen or redrill		Abandon	
				Notices	Decisions	Notices	Decisions	Notices	Decisions	Notices	Decisions
1	3 S	10 W	Brea Canyon			2	1				
2	3 S	10 W	Birch Oil	1	1	1	1	1	2		
2	3 S	10 W	Brea Canyon	1	1			1	1		
			Totals	2	2	3	2	2	3		

The proved area of this field has not been extended during the past year, and may be accounted for by the comparative inactivity in drilling operations.

Following is a list of all decisions made during the past year relative to operations in this field.

DECISIONS.

T. 3 S., R. 10 W., S. B. B. & M.

SECTION 1.

Brea Cañon Oil Co.

Well No. 29, shut-off. C-109.

Test showed that 15½″ casing excluded water above a depth of 1211′.

SECTION 2.

Birch Oil Co.

Well No. 12, redrill. CC-313.

Approved proposal to redrill and plug the bottom of the well, indicating depths at which shooting and plugging should be done.

Well No. 12, redrill. CC-317.

Approved proposal to make minor change in depth at which one of the various plugs, recommended in No. CC-313, should be placed.

Well No. 14, drill. CC-187.

Approved estimated depth of water shut-off.

Well No. 14, shut-off. C-129.

Test of water shut off approved.

Brea Cañon Oil Co.

Well No. 14, deepen. CC-200.

Proposal to deepen approved.

Well No. 30, commence drilling. CC-236.

Estimated depth of water shut off approved.

PUENTE FIELD.

The limits of the producing area of this field were originally confined within the boundaries of Sections 34 and 35, T. 2 S., R. 10 W., S. B. B. & M., Los Angeles County, and referred to the development of this portion of the Puente Hills only. Because of the decline in production and development in the old field, and recent drilling operations in various portions of the Puente Hills, it has been deemed advisable to include in the Puente field all of the region covered by the Puente Hills, with the exception of territory mapped in the Olinda, Brea Cañon and Whittier fields described elsewhere.

A detailed history of the Old Puente field as given in Bulletin No. 63 of the California State Mining Bureau, shows 72 wells drilled by Rowland and Lacy, 11 wells drilled by the Puente Oil Co. on the Rowland lease, and 5 wells drilled by the Menges Oil Co., all in Sections 34 and 35, T. 2 S., R. 10 W. These three properties are now under lease to the Columbia Oil Producing Company.

Out of a total of 88 wells drilled in this area during the period from 1880-1911, 44 wells are producing and 44 are idle or abandoned, at the present time. The production of the old Puente field amounted to about 2000 bbls. gross during the month of June, 1917, of which 5.4% was water. Production per well varies from 4 to 185 bbls. per month and the wells are pumped on an average from 1 to 4 days per month. Some of the wells in this group have been producing for over 20 years.

The Copa de Oro Petroleum Co. commenced drilling Well No. 1, on Section 20, T. 2 S., R. 9 W., in February, 1916. This well was drilled to a depth of about 3400′ without developing oil in commercial quantities. A study of the geology of this area as mapped by Bulletin No. 69, California State Mining Bureau, shows that this well was located on an anticline in the sandstone of Monterey age.

The Gold Seal Petroleum Company commenced drilling Well No. 1, Section 16, T. 2 S., R. 9 W., in March, 1916. The log of this well has not been received.

A. T. Currier Well No. 1, Section 17, T. 2 S., R. 9 W., was drilled to a depth of 4173′, and, according to the log, oil showings were recorded in this well at depths of about 1200′ and 3000′. Drilling operations are now suspended.

WHITTIER FIELD.

There are about 501 acres of proved land in this field. The following companies were operating here during June, 1917: Standard Oil Company, Central Oil Company of Los Angeles, Colorado Oil Company, Whittier Crude Oil Co., Home Oil Company and Union Oil Company. According to June production reports, there were 139 producing wells which made a total of 96,646 barrels of clean oil and 78,711 barrels of water. There were 244 wells drilled in this field, of which number 105 were idle, or abandoned. Some of the abandoned wells were drilled many years ago and were not deep enough to encounter oil. Others were abandoned on account of mechanical difficulties after oil bearing formations had been encountered. A number of wells were abandoned or shut down on account of small production.

It is interesting to note that Well No. 1 of the Central Oil Co., located in Section 23, T. 2 S., R. 11 W., S. B. B. & M., was completed over 20 years ago and is still producing a small amount of oil.

GEOLOGY.

The general structure of the Whittier field is due to faulting probably along an unconformable contact between Fernando and Puente formations, giving rise to an anticlinal structure facing the La Habra Valley, which structure is responsible for the accumulation and storage of oil in the formations directly beneath (capping) beds of Fernando age. The surface geology of this field has been described in detail in U. S. Geological Survey Bulletin No. 309, and in Bulletins Nos. 63 and 69 of the State Mining Bureau.

In previous publications, the underground structure of this field had been considered complex and considerably broken up as a result of faulting. This appears to be true in the fault zone. Recent developments and a detailed study from peg models and cross sections made by this department of the area included in Sections 22, 23 and 26, T. 2 S., R. 11 W., reveals conformity of underground structure to surface exposures. The south flank of the Whittier anticline in this area is a simple monocline.

A study of logs of old wells reveals little regarding underground conditions on account of poor records kept by early operating companies.

A study of the peg model shows that three distinct oil zones have been penetrated and that intermediate water probably lies between these zones. It is worthy of note that the zones are found at fairly uniform stratagraphic depths by wells penetrating them, and by application of information shown by the log records, the depths at which these zones should be encountered may be anticipated at uniform stratagraphic depths in new wells drilled in this area.

These oil zones in general are uniformly parallel. The distance from the top of the first zone to the top of the second zone averages about 500′. The average distance from the top of the second zone to the top of the third zone is 600′. The first and second zones are each approximately 200′ in thickness. There is no definite information as to the thickness of the third zone in this area, on account of the comparatively small number of wells which have passed through this zone.

Logs of some of the wells penetrating this zone indicate a thickness of approximately 1000′. Some of the wells have probably passed through the third zone and are producing from a possible fourth zone.

The two upper oil zones encountered on Sections 26, T. 2 S., R. 11 W., outcrop in succession before reaching the apex of the fold in the S. W. ¼ of Section 23, T. 2 S., R. 11 W., S. B. B. & M., and the water sands below the second oil zone probably also outcrop in this area. This condition creates a narrow strip of territory running northwest and southeast along the crest of the anticline in which wells drilled into the third zone do not encounter water bearing formations which are penetrated by wells drilled on either flank of the anticline, A number of deep wells drilled near the apex of the anticline are producing oil which is from 5° to 8° B. lighter in gravity than the oil produced from the third zone in the same locality. This production is probably obtained from the fourth zone, which does not contribute to the production of present wells drilled in the area to the south.

WATER CONDITIONS.

The water conditions in portions of this field are serious.

Some of the early wells drilled did not effectively prevent water from above the oil sands from entering the producing formations. Water was not shut off at uniform stratagraphic depths in some of the wells drilled in this field. This may be largely attributed to the incomplete knowledge regarding geological conditions. Work done in abandoning wells previous to the inauguration of this department was, in many cases, improperly done and damage to oil deposits may be ensuing.

The source of the greater portion of the water trouble in this field probably results from water bearing formations having been penetrated between the oil zones without protecting the various zones from this water.

The policy of supervising the drilling of new wells has been that each oil zone penetrated should be protected from water. This is accomplished by the co-operation of operators with this department.

The production of all wells completed during the fiscal year, with one exception, is comparatively free from water, showing that it has been profitable to employ scientific methods in drilling new wells in this field.

FUTURE DEVELOPMENTS.

A number of old wells in Sections 22 and 23, T. 2 S., R. 11 W., have been deepened and the production of oil materially increased.

The line of development during the past year has been along the south flank of the anticline and particularly in Section 26, T. 2 S., R. 11 W. The proven area of the field has been extended in this direction and the results indicate a further extension of proven area during the coming year. It would seem advisable and necessary to repair or abandon and plug certain old wells which produce comparatively small amounts of oil and large amounts of water in order to eliminate some of the water trouble, and protect the territory.

The following is a summary of notices received and decisions rendered during the past year:

Section	Township	Range	Company	New wells		Test of water shut off		Deepen or redrill		Abandon	
				Notices	Decisions	Notices	Decisions	Notices	Decisions	Notices	Decisions
22	2 S	11 W	Central	1	1	------	------	3	3	------	------
22	2 S	11 W	Standard	2	1	3	2	2	2	------	------
22	2 S	11 W	Home	------	------	------	------	2	2	------	------
23	2 S	11 W	Central	------	------	------	------	------	------	1	1
26	2 S	11 W	Standard	6	6	14	11	1	1	------	------
			Totals	9	8	17	13	8	8	1	1

Following is a list of decisions rendered covering operations at wells in this field for the past year, accompanied by a brief description showing character of work done at each well and recommendations made by this department:

DECISIONS.

T. 2 S., R. 11 W., S. B. B. & M.

SECTION 22.

Standard Oil Co.

Well No. 11 (Fidelity) Shutoff. C-101.

Results of test did not show that water was completely shut off. Recommended pumping well for further test.

Well No. 11, (Fidelity), redrill. C-165.

Approved proposal to redrill and deepen. Previous production test indicated that water was shut off.

Central Oil Co.

Well No. 2-C, deepening. CC-135.

Recommended that company shut off water before deepening into lower oil sands.

Well No. 30-B, deepening. CC-114.

Recommended shutting off water before deepening.

Well No. 31-B, drilling. CC-210.

Approved proposed depth of water shut off.

Well No. 38-B, deepening. CC-134.

Approved proposal to deepen.

Standard Oil Co.

Well No. 10, Fidelity, deepen. CC-136.

Approval to deepen was given, providing company shut off "top" water.

Well No. 12, Savage, shut-off. C-157.

The results of the test indicated that water from the shut-off point was not passing to lower levels in the well. There was no definite evidence to show that oil-bearing formations above the shut-off point were protected from water.

Standard Oil Co.

Well No. 14, Savage, drill. CC-156.

Approved proposed shut-off depth and recommended that heavy mud be circulated in well to protect oil-bearing formations above shut-off point and that results be carefully watched in surrounding wells.

Home Oil Co.

Well No. 16, redrill. CC-253.

Approved proposal to redrill and clean out in order to test a sand formerly shut off.

Well No. 20, redrill. CC-254.

Approved proposal to redrill and plug bottom of well and produce from upper formations.

SECTION 23.

Central Oil Co.

Well No. 24-C, abandon. CC-324.

Approved proposed method of abandonment.

SECTION 26.

Standard Oil Co.

Well No. 42 MW, shut-off. C-95.

Test of water shut off approved.

Well No. 42 MW, shut-off. C-100.

Test of water shut-off satisfactory.

Well No. 44 MW, shut-off. C-121.

Test of water shut off above the first oil zone approved.

Well No. 44 MW, shut-off. C-154.

8¼″ casing cemented above the second oil zone and the test showed that water from above the shut-off point was not passing to lower levels in the well. No evidence was presented by the company to show that the first or upper oil zone had been protected from probable water between the first and second oil zones.

Well No. 45 MW, shut-off. C-125.

Water was shut off above the first oil zone and test of shut off approved.

Well No. 46 MW, drill. CC-183.

The company proposed to shut off water at a depth of about 1600′ in order to test sands carrying heavy oil. This department recommended that water be shut off below these sands. After some correspondence, approval was given to shut off water above the heavy oil sands. The cementing job failed and water was later on shut off below the heavy sands, or first oil zone.

Well No. 46 MW, shut-off. C-182.

10″ casing was cemented below the first oil zone and above the second oil zone. The results of the test demonstrated that water from above the second oil zone was not passing to lower levels in the well.

Well No. 47 MW, commence drilling. CC-227.

Approved proposed depth for shutting off water.

Well No. 47 MW, shut-off. C-155.

10″ casing was cemented above the second oil zone and test of water shut off approved.

Well No. 48 MW, commence drilling. CC-251.

Recommended that the company shut off water above the first oil zone in addition to their proposed work of shutting off water immediately above the second zone.

Well No. 48 MW, shut-off. C-184.

Water shut off above the first oil zone and test of shut-off approved.

Well No. 39 MW, shut-off. C-62.

Test of water shut-off approved.

Well No. 40 MW, shut-off. C-89.

Test of water shut-off approved.

Well No. 41 MW, shut-off. C-105.

Test of water shut-off approved.

Standard Oil Co.

Well No. 41 MW, production test. CC-282.

Test of water shut off above upper oil sands was approved by this department. The company deepened the well and encountered water below the upper oil sands and attempted to shut off water by pumping cement through the perforations in the 8¼" oil string. After failing to shut off the water, the 6¼" casing was cemented and also failed to effect a shut-off. Approval was given to clean out the well and make a production test. Attention was called to the unprotected condition of oil sands which were shut off and that these sands were shut off without the approval of this department. After receiving approval to make production test, the company drilled the well 228′ deeper and at present the well averages about 16 barrels of oil and over 200 barrels of water per day.

Well No. 42 MW, deepen. CC-265.

Data compiled by this department showed that the upper oil sands were protected from entrance of water above them. Approved proposal to deepen.

Well No. 49 MW, shut-off depth. CC-305.

The company originally proposed to shut off above the second oil zone and later filed notice of intention to make an additional shut-off above the first zone. The latter proposal received the approval of this department.

Well No. 50 MW, commence drilling. CC-231.

The proposed depth of water shut off was approved.

MONTEBELLO FIELD.

The Montebello Oil Field is situated about one mile north of, and derives its name from, the town of Montebello, a small town on the Whittier highway, about half way between Whittier and Los Angeles.

It occupies the crest and flanks of an anticlinal dome known as the La Merced Hills, which form a spur extending in an east-west direction from the eastern extremity of the Rapetto Hills, both ranges merging and passing beneath the narrow valley formed by the Rio Hondo and San Gabriel rivers.

TOPOGRAPHY.

The La Merced Hills, comprising the region of the newly developed oil field, appear topographically as a low range of hills, striking almost east and west through the northern part of Sections 1, 2 and 3, T. 2 S., R. 12 W., S. B. B. & M., and Section 6, T. 2 S., R. 11 W., and through the southern portion of Sections 35 and 36, T. 1 S., R. 12 W.

Erosion has not yet effaced the evidences of the original dome contours, the hill appearing to rise gently from the valley floor, the longer axis being east and west, and the crest of the dome being somewhat east of the center of the hill. The eastern limit of the hills has been truncated by erosion of the Rio Hondo river, which here rises to the surface over the eroded edges of the bed rock formations composing the hill to disappear again in the gravels in the channel to the south.

The north flank of the La Merced Hills extend into a low range of hills trending approximately north 70° W., known as the Rapetto Hills. The latter extend from the San Gabriel valley at this point to the northern portion of Los Angeles City, forming the main topographic relief between East Los Angeles and the Puente Hills.

GEOLOGY.

Pleistocene: Examination of the surface exposures of La Merced Hills shows formations of Pleistocene and Fernando ages only. Pleistocene river gravels flank the hills on all sides, except the eastern end, where the Rio Hondo river cuts across the range. The gravels, which, at some previous time, may have covered the entire range, have been eroded from the crest of the hill, exposing the underlying formations of Fernando age. The thickness of the pleistocene varies from zero feet at the contact with the Fernando, to several hundred feet on the sides of the hill and in Sycamore Cañon to the north, and the color is reddish brown, characteristic of the pleistocene river gravels of California. These gravels furnish an excellent soil for the citrus orchards which lie at the base and part way up the sides of the hill.

Fernando: Beneath the pleistocene gravels lie apparently conformable sands and shales of upper Fernando age. The Fernando is exposed along the crest and on the east end of the hill and is composed for the most part of soft sandstone and grey sandy shale. Fossil shell remains have been obtained from the river bluffs along Lincoln Avenue.

The thickness of the Fernando formation in the Merced Hills can not be determined from outcrop in these hills. Formations of Fernando age are known to be several thousand feet in thickness in the Puente Hills to the southeast, according to Bulletin No. 309 of the U. S. Geological Survey, but, until some palæontologic evidence has been presented from borings of wells drilled in this field, no definite knowledge can be obtained as to its actual thickness. There is a possibility that beds of hard sandstone and pebble conglomerates encountered at depths of 1500′ to 2000′ by wells which have been drilled in this field, may mark the base of the Fernando formation and that the production which is now being obtained from the field below these hard beds originated from sands and sandy shales of Puente age. The shale bodies of the oil zone are variously logged by drillers as blue and brown shale. In the western portion of the field, showings of oil have also been reported above the hard beds of sandstone, and pebbles. These showings are probably in beds of Fernando age and have not been tested by wells penetrating them.

Puente formation: No evidence of the Puente formations has been found, up to the present time, in outcrop in this area. However, beds of this age are exposed in the Rapetto Hills to the north and west, and are known to underlie beds of Fernando age in the Puente Hills, where they are very important as oil bearing formations.

Structure: The general structure of the Merced Hills, as revealed by numerous dips in beds of Fernando age, and study of a peg model of the field, constructed by this department, indicate that there is an anticline running east and west and conforming in a general way to the surface contours of the range.

The axis of the anticline appears to rise from the valley on the west in the northern portion of Sections 2 and 3, T. 2 S., R. 12 W., passing through the northern part of Section 1, T. 2 S., R. 12 W., and Section 6, T. 2 S., R. 11 W., where the structure is masked by the river gravels of the Rio Hondo river. The logs of wells drilled close to the hill and in the river bed indicate a steepening of the dip on the flanks of the anticline in this area, or a plunge in the axis of the anticline itself toward the east.

The surface dips in the Fernando, as measured on the south flank of the anticline, are greater than corresponding dips on the north flank.

The anticline of La Merced Hills is succeeded to the north by a syncline, with possible minor folding as the structure merges into the Rapetto Hills. However, the major structure is so masked by pleistocene deposits that the interpretation of this structure may finally have to rest with prospective wells drilled in this area.

The underground structure of the oil horizon as revealed by cross-sections and peg model of this field, shows in a general way conformity to the structure as mapped on the surface, and already described.

However, the dip between top of oil sands recorded in logs of Standard Oil Co. "Baldwin" No. 2, and Union Oil Co. "La Merced" No. 1, Section 1, T. 2 S., R. 12 W., is 8°. Surface dips of Fernando formations exposed between these wells range from 25° to 50°, the greater dip being recorded in down the slope portion of the area in which these wells have been drilled.

The fact that oil has been encountered on the property of the Union Oil Company, "La Merced" Well No. 1, at a less depth stratagraphically than indicated by surface dips and study of log records of Standard Oil Company wells near the axis of the anticline, shows either a change in dip of the Fernando not shown on the surface, or the presence of an upper oil horizon which is either barren or not recorded in wells drilled near the top of the anticline.

The gravity of the oil produced by the Union "La Merced" No. 1, is about 3° Baumé heavier than the oil produced by Standard "Baldwin" Well No. 2.

Out of a total of 30 wells shown by the peg model as drilling or completed at present writing, 17 are located close to and parallel with the axis of the anticline, throughout its extent, where shown on the surface. A correlation of oil bearing formations and the beds of hard sandstone and pebble conglomerate previously mentioned, and penetrated by these wells, shows a gradual and fairly uniform rise of the axis from west to east. Wells near the eastern end of the present producing area penetrate oil bearing formations at a depth of about 1100′ below sea level.

HISTORY OF DEVELOPMENT.

The Montebello Field, the latest and one of the most important additions to the oil fields of California, has lain in the center of an oil producing belt in Southern California for years, undiscovered. Many attempts have been made to follow the oil belt between the Whittier and Los Angeles City fields, but without success, as shown by numerous wells drilled in the Rapetto Hills (see page 333, Bulletin No. 63 of the California State Mining Bureau).

The discovery of this field is due solely to scientific geological study, and not as the result of development along oil seepages. Drilling was commenced by the Standard Oil Company on the first well in this field, on December 12, 1916. This well was completed February 24, 1917, opening up a new field which promises to rank among the most productive fields in the state. This was the first well completed in this field, and made an initial production of about 650 bbls. of oil per day, at a depth of 2395′, which production it has maintained with but slight decrease up to the present time. Four wells have been completed by the Standard Oil Co. and one by the Union Oil Co. In addition, there are 25 drilling wells and 4 new derricks.

Among the companies operating in this field are the following: Pan-American Petroleum Co., Interstate Oil Co., Riverside Portland Cement Co., Clara Baldwin Stocker, Petroleum Midway Co., Standard Oil Co., Union Oil Co., San Gabriel Petroleum Co., Red Star Petroleum Co., California Star Oil Co., Rich Ranch Co., and the Amalgamated Oil Co.

With the exception of the Interstate Oil and the San Gabriel Petroleum companies, all operators are using the rotary system of drilling, or a combination of rotary and standard systems, the rotary being used to set the water string. It has been claimed by operators using this system that oil showings may be seen in the rotary mud soon after oil bearing formations have been encountered.

The discovery of oil by the Union Oil Company near the base of the Merced Hills has increased activities of oil promoters in leasing prospective oil lands in the valley to the south, some distance from the foot of the hill.

Production: During the month of June, 1917, the production from this field averaged 852 bbls. of oil and no water per day from two producing wells.

At the present time (Dec. 1, 1917) there are 5 wells producing. The total monthly production of these wells amounts to approximately 260,000 bbls. of oil. One of the new wells was drilled to a depth of 3755′, having been drilled 1725′ below the depth of water shut off. This well commenced flowing over the derrick through the 8¼″ oil string at an estimated rate of about 15,000 bbls. per day. The well is now under control and flowing at the rate of between 6000–7000 bbls. of about 26° Baume gravity oil per day.

The well is located near the axis of the anticline and the production of the well shows that a prolific zone has been encountered below the upper zone from which adjoining wells produce an average of about 500 bbls. of oil per day. The absence of any great volume of gas with the oil production of this well, in contrast to a number of flowing wells in other fields in the state, is a feature worthy of note.

Water Conditions: A map drawn to a scale of 100′ to 1 inch has been completed showing all of the proved area and including all property on which development work is being carried on. A peg model, constructed to the same scale, is being kept up to date by aid of weekly reports and log records furnished by operators in this field. Particular attention is given by this department to aiding and directing the various companies to shut off water at the proper stratagraphic depth in each new well. Many of the older fields of this state were practically ruined by disregarding such a vital factor, in the rush to produce from gusher sands without any regard for the protection of oil sands shut off, which afterwards acted as conductors of water to neighboring wells drilled into and producing from these oil sands.

The wells already producing in this field average considerably less than 1% of water in their fluid production.

Future Developments: The productive limits of this field have not been determined by present wells drilled. The area in which active drilling operations are being carried on is not confined to the top of the hill, which represents the higher portion of the anticline.

The Amalgamated Oil Company is drilling a well about one mile east of the nearest producing well on the "Temple" lease of the Standard Oil Co., and in line with the projected axis of the anticline.

The Rice Ranch Oil Co. is drilling a well about one mile in a northwesterly direction from the Standard Oil discovery well.

The Pan-American Petroleum Co. is engaged in drilling a well near the western end of La Merced Hills, about 2 miles west of the discovery well in this field.

The results of drilling in progress at these wells is being watched with considerable interest, and further developments will be influenced to a great extent by the drilling in progress.

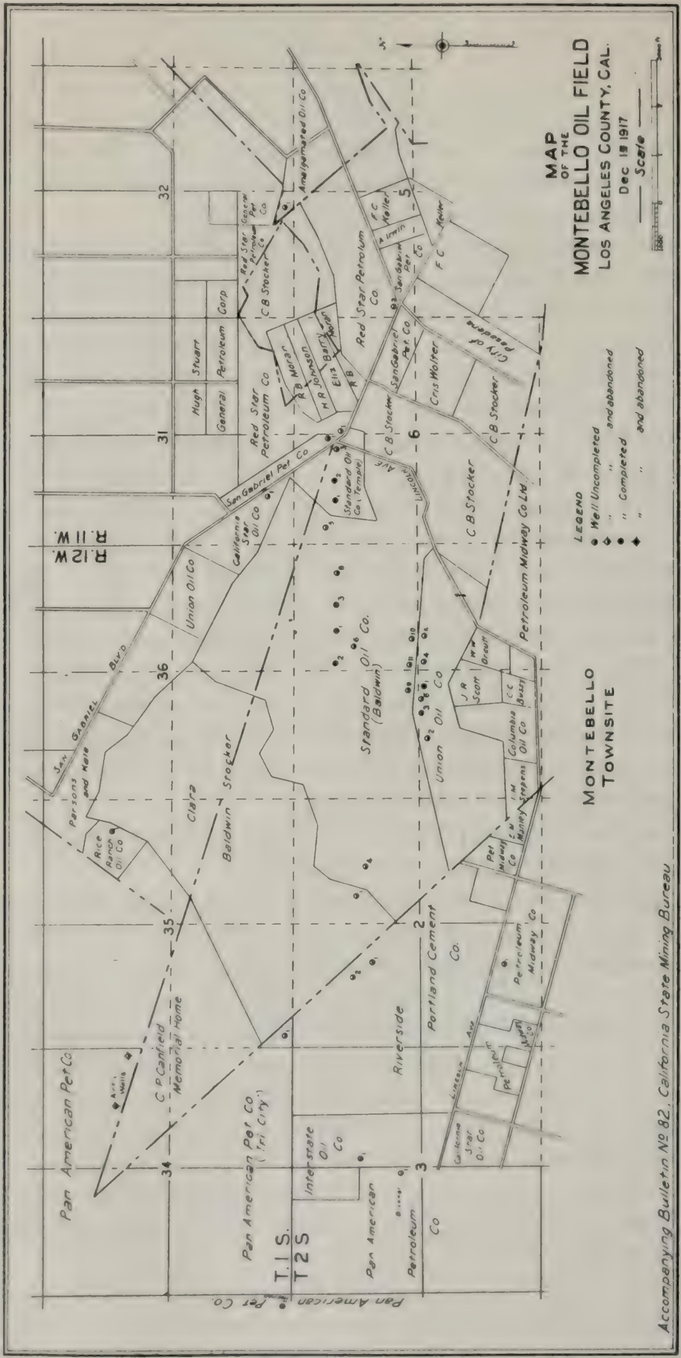
MAP
OF THE
MONTEBELLO OIL FIELD
LOS ANGELES COUNTY, CAL.
Dec 1st 1917
Scale
LEGEND
Well Uncompleted
" " and abandoned
" Completed
" " and abandoned
MONTEBELLO TOWNSITE
R.12W.
R.11W.
T.1S.
T.2S.
31
32
36
35
34
2
3
5
6
San Gabriel Blvd
Lincoln Ave
Pan American Pet Co
C P Canfield Memorial Home
Pan American Pet Co ("Tri City")
Interstate Oil Co
Pan American Petroleum Co
Riverside Portland Cement Co.
Clara Baldwin Stocker
Standard Oil Co. (Baldwin)
Union Oil Co
Union Oil Co
California Star Oil Co
San Gabriel Pet Co
Standard Oil Co (Temple)
Red Star Petroleum Co
General Petroleum Corp
Hugh Stuart
C B Stocker
Red Star Petroleum Co
General Pet Co
Amalgamated Oil Co
R B Moran
H R Johnson
Eliz Barry
Red Star Petroleum Co.
F C Keller
Irwin
San Gabriel Pet Co
City of Pasadena
Cris Wolter
C B Stocker
Petroleum Midway Co Ltd
W W Orcutt
J R Scott
C C Bussy
Columbia Oil Co
I M Stephens
Pet Midway Co
Petroleum Midway Co
California Star Oil Co
Parsons and Kale
Rice Ranch Oil Co
Pan American Pet Co.
Accompanying Bulletin No 82, California State Mining Bureau

FIG. 21.

The following is a summary of notices received and decisions rendered by this department for this field during the past year. Reference to this table shows that all of the development in this field related to the drilling of new wells.

Section	Township	Range	Company	New wells		Test of water shut off		Deepen or redrill		Abandon	
				Notices	Decisions	Notices	Decisions	Notices	Decisions	Notices	Decisions
6	2	11	Standard	1	1	1	1				
1	2	12	Union Oil	3	3						
1	2	12	Standard	3	2	1	1				
2	2	12	C. B. Stocker	1	1						
2	2	12	Standard	1	1						
2	2	12	G. W. Improv't (Riv. Portl'd)	2	1						
			Totals	11	9	2	2				

Following is a list of all decisions rendered covering drilling operations in this field during the fiscal year.

DECISIONS.

T. 2 S., R. 11 W., S. B. B. & M.

SECTION 6.

Standard Oil Co.

Well No. 1 (Temple), drilling. CC-221.

Approved proposed depth of water shut-off.

Well No. 1 (Temple), shut-off. C-166.

Test of water shut-off satisfactory.

T. 2 S., R. 12 W., S. B. B. & M.

SECTION 1.

Union Oil Co.

Well No. 1, La Merced, commence drilling. CC-325.

Approved proposed depth for shutting off water. The exact depth at which water should be shut off was unknown on account of the distance from producing wells. Stated that a peg model was under course of construction and that further recommendation may be made at a later date. Subsequent information obtained by the company in drilling the well showed that oil sand was about 100′ less depth than proposed for water shut off. A successful shut-off was made above the oil sand.

T. 2 S., R. 12 W., S. B. B. & M.

SECTION 1.

Union Oil Co.

Well No. 2, La Merced, commence drilling. CC-326.

Approved proposed depth for shutting off water. Stated that a peg model was under construction and that further recommendations may be made at a later date.

Well No. 3, La Merced, commence drilling. CC-327.

Approved proposed depth for shutting off water. Stated that a peg model was under course of construction and that further recommendations may be made at a later date.

Standard Oil Co.
  Well No. 1, Baldwin, shut-off. C-135.
    Test of water shut-off satisfactory.
  Well No. 3, commence drilling. CC-248.
    Approved proposed depth for shutting off water.
  Well No. 2, commence drilling. CC-228.
    Approved proposed depth for shutting off water.

SECTION 2.

Clara Baldwin Stocker.
  Well No. 1, commence drilling. CC-286.
    Approved proposal estimated depth at which water should be shut off.
Standard Oil Co.
  Well No. 4, Baldwin, commence drilling. CC-257.
    This well was located nearly two miles from the nearest producing well when decision relative to shut-off depth was made. Approved the proposal received from the company estimating limits between which water should be shut off.
Great Western Improvement Co.
  Well No. 1, commence drilling. CC-235.
    Approved proposed estimated depth for shutting off water.

SALT LAKE FIELD.

References to the location and geology of this field are given in California State Mining Bureau Bulletin No. 73.

SUMMARY OF WATER CONDITIONS.

During the month of June, 1917, according to the monthly production reports furnished this department, there was a total fluid production of 168,648 barrels. Of this amount, 103,073 barrels were oil and 65,575 barrels were water. Reference to Table 1 shows that there were 243 wells producing. These wells averaged 14 barrels of oil and 9 barrels of water per well per day. Two hundred ten wells in this field produced a total of 19,736 barrels of water, or an average of 3 barrels of water per day each. There were 33 wells producing a total of 45,839 barrels of water, or an average of 46.3 barrels of water per day each. These figures show that the greater portion of the water trouble in this field is confined to a comparatively small number of wells. Study of a map prepared by this department showing the comparative amount of water produced by each well, shows that these wells are located in three well-defined areas, the first along the eastern side of the productive part of the field, in Sections 15 and 22, the second along the western side, in Sections 17 and 20, T. 1 S., R. 14 W. The third area is located in Section 25, T. 1 S., R. 15 W., Beverly Hills.

The source of water entering these wells has not been definitely determined. The fact that the greater portion of the water trouble in this field was confined to certain groups of wells was pointed out in Bulletin No. 73, issued by this department. Remedial work along the lines suggested in this bulletin has been carried on in the western part of the producing area in Sections 17 and 20, T. 1 S., R. 14 W. Four wells in this area have been abandoned and plugged under the supervision of this department during the past year. These wells were abandoned on account of small production and their general water conditions, and the result of work done should improve the water condition of adjoining wells.

For improvement of general water conditions and increase in production in certain wells in the eastern portion of this field, see accompanying report on method and results of mudding and cementing operations at Rancho La Brea Well No. 41, Section 15, T. 1 S., R. 14 W., page 163.

The following is a summary of notices received and decisions rendered for this field during the fiscal year:

Section	Township	Range	Company	New wells		Test of water shut off		Deepen or redrill		Abandon	
				Notices	Decisions	Notices	Decisions	Notices	Decisions	Notices	Decisions
20	1 S	14 W	Jas. F. Ross	2	1	------	1	------	------	------	------
20	2 S	14 W	Garbutt Oil	------	------	------	------	------	------	4	4
28	1 S	14 W	E. A. Clampitt (Arthur Melton)	2	------	------	------	2	2	------	------
25	1 S	15 W	West Coast	------	------	1	------	1	1	------	------
15 16 21	1 S	14 W	Rancho La Brea	------	------	1	------	1	------	------	------
			Totals	4	1	2	1	4	3	4	4

Reference to the above summary shows that drilling operations were commenced at four wells in this field during the past year. Oil in commercial quantities has not been obtained from any of these wells.

The proved area of this field has not been increased during the last year. The proved acreage for 1916–17, as shown by Table No. 1, is 1017 acres.

Following is a list of all decisions rendered covering operations in this field during the year ending June 30, 1917:

DECISIONS.

T. 1 S., R. 14 W., S. B. B. & M.

SECTION 20.

James F. Ross.

Well No. 3, drilling. CC-132.

Approved proposed estimated depth of shutting off water.

Well No. 3, shut-off. C-136.

Recommended pumping test of upper oil sand on account of a small rise in the water level while standing bailed for test.

Garbutt Oil Co.

Well No. 1, abandon. CC-331.

Approved proposal to abandon this well, indicating the depths at which shooting and plugging with cement should be done.

Well No. 3, abandon. CC-332.

Approved proposal to abandon this well, indicating the depths at which shooting and plugging with cement should be done.

Well No. 5, abandon. CC-334.

Approved proposal to abandon this well, indicating the depths at which shooting and plugging with cement should be done.

Well No. 11, abandon. CC-333.

Approved proposal to abandon this well, indicating the depths at which shooting and plugging with cement should be done.

SECTION 28.

E. A. Clampitt.

Well No. 1 (Melton), deepen. CC-329.

Approved proposal to deepen about 100 feet.

Well No. 2 (Melton), deepen. CC-328.

Approved proposal to deepen about 600 feet.

T. 1 S., R. 15 W., S. B. B. & M.

SECTION 25.

West Coast Oil Co.

Well No. 59, Wolfskill, redrill. CC-138.

Approved proposed depth for shutting of water. Recommended certain plugging if casing did not follow old hole.

REPORT ON MUDDING AND CEMENTING OPERATIONS AT RANCHO LA BREA OIL COMPANY WELL No. 41.

Sec. 15, T. 1 S., R. 14 W., S. B. B. & M., Salt Lake Field.

Along the line of development of the mudding process for excluding water from oil wells, which process has been used successfully, in numerous instances in California, the following mudding operation is described more or less in detail with the idea that other operators confronted with similar problems may profit by the experience of this company in attacking such problems when the more common method of putting in cement plugs has failed.

Rancho La Brea Oil Company Well No. 41 was completed in September, 1911, at a depth of 955 ft., and made an initial production of over 100 barrels of oil per day and no water. The production of this well dropped considerably from the initial production until January 24, 1916, on which date the company filed a proposal to deepen this well and cement a string of casing below the oil sands, in order to protect them from water, which they expected to develop at a depth of about 1800 ft., for use on the property.

Water sand was unexpectedly encountered at a depth of 1123′ and penetrated to a depth of 1285′. Drilling operations were stopped when this depth was reached and several attempts were made to plug the bottom of the well in order to protect the oil sands from water.

Various methods of bridging and cementing were employed by the company and by cement experts, but without success.*

In April, 1917, an official of the company called upon this department for advice relative to shutting off water in this well.

Detailed information regarding the physical condition of the well was requested from the company. A study of the records and an interview with the field superintendent of this company, Mr. F. J. Prehoda, brought out the fact that cement placed in the bottom of this well was carried back into the formation. This probably accounted for the failure of the various cementing jobs to shut off the water. The result of this interview was an agreement on the part of the company to pump mud-laden fluid into the sands near the bottom of the well. Mr. Prehoda, who has had considerable experience in the use of mud-laden fluid, was in active charge of the work and co-operated with the State Mining Bureau in every way looking toward the elimination of the water trouble which was fast spreading to adjoining wells on this and neighboring properties.

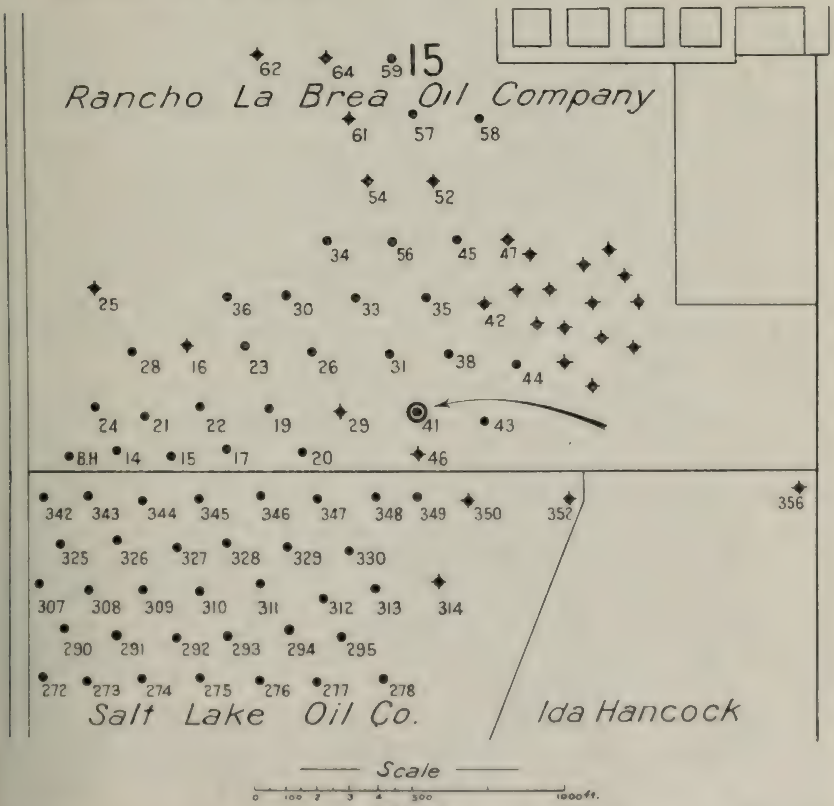

Fig. 22.

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*In order that the history of operations at this well might be as complete as possible at the time of going to press, the work has been reported up to date. (Dec. 20, 1917.)

Previous to the beginning of mudding operations, the well had been bridged from bottom (1285′) up to 1100′ with bricks and rocks driven down by the tools.

On May 10, 1917, this bridge was drilled out to a depth of 1185′ and mudding operations started. The oil string was set at a depth of about 1100′, and mud about the consistency of rotary mud pumped into the well through 3″ tubing, which extended to a depth of 1168′. About 24 hours after mudding operations were started, Salt Lake Oil Company's wells Nos. 313, 329, 330, 347, 348 and 349, and Rancho La Brea Oil Company's well No. 38 pumped water carrying considerable mud. Well No. 313 of the Salt Lake Oil Company is one-quarter mile distant from Rancho La Brea Well No. 41.

A total of about 700 cu. yds. of adobe and 40 cu. yds. of sawdust were pumped into this well in the first operation. Thin mud was first pumped in, and as soon as it appeared in the adjoining wells mentioned, these wells were, upon request of this department, shut down during subsequent mudding operations. Several hundred cubic feet of adobe were put into the well without any apparent success, as it seemed that the mud was wasted back into the formation. Upon suggestion of this department, sawdust was introduced into the mud and a favorable effect immediately noticed, in that, shortly afterwards, June 21, circulation was obtained. After the well had been thoroughly mudded, the mud-laden fluid stood at the surface for several days. On August 1, 1917, the mud was washed out of the hole and the well was bridged from 1109′ to 1095′ by tamping rock into the formation. The rock was lowered into the well in four shells made of galvanized iron. The bottom of the well was then cemented with 50 sacks of cement pumped through tubing, bringing the top of the cement plug up to a depth of 1080′.

From a study of monthly production reports for Salt Lake Oil Company's wells Nos. 312, 313, 329, 330, 346, 347, 348 and 349, adjacent to Rancho La Brea well No. 41, upon which the plugging off of bottom water was completed about August 1, 1917, it will be noted that, for the month of August, wells 330, 347 and 348 showed a marked increase in the amount of oil produced, and a corresponding decrease in the amount of water produced, per day; well No. 330 producing about three times as much oil as formerly; well No. 347 nine times as much oil and one-half as much water; well No. 348 two and one-half times as much oil as formerly.

In April, 1917, the production of Salt Lake Oil Company's wells Nos. 329, 330, 347 and 348 was 573 barrels of oil and 4252 barrels of water. In August, the production of the same wells was 1912 barrels of oil and 1268 barrels of water.

Wells Nos. 38 and 43, on the Rancho La Brea Oil Company's property, probably were affected by water coming from well No. 41. After No. 41 had been mudded, No. 38 was started pumping, and jumped approximately 75 barrels of oil per day. Previous to this time the well pumped only water. Well No. 43, which had been idle for some time, because the production of the well previous to mudding operations at No. 41 was all water, was put on the pump and produced 25 barrels of oil and 100 barrels of water per day. This well has not produced any mud.

After the cement plug had been pumped into Rancho La Brea well No. 41, and the well had been allowed to stand for three weeks, the well was put on the pump and produced between 300 and 400 barrels of clear salty water per day. No mud used during mudding operations appeared in the well. The cement plug which had been put into the well was found in place, and the water which was entering the well was probably coming from formations above the top of the plug.

About one month after the cementing of well No. 41, water again broke into Rancho La Brea well No. 38. The well pumped nothing but water, and mudding operations were again started at well No. 41. During the second mudding operation, four feet of the cement plug in the bottom of the well were drilled out, five old bullropes cut into three-inch lengths and mixed with adobe; about 70 yds. of adobe and 10 yds. of sawdust were pumped into the well. Mud was pumped into the well under a pressure of about 400 pounds per square inch.

Coincident with the reappearance of water in Rancho La Brea wells Nos. 38 and 41, and subsequent to the conclusion of the first mudding operations at the latter well, water conditions at certain wells at the Salt Lake Oil Co., apparently underwent a change. Production reports for September and October indicate that well No. 347 returned to about its original production. Wells Nos. 348 and 330 still show some improvement over conditions previous to the repair work. On the other hand, well No. 329 shows an increase of 900% in the production of water with an increase of only 200% in the production of oil, indicating that possibly the water channel to No. 329 was not as thoroughly mudded as were the channels of Nos. 330, 347 and 348. Well No. 346 was apparently not affected by the repair work. The reports also indicate that well No. 349 was probably affected, although during August it showed a decrease in oil produced and a slight increase in water produced. These reports also indicate that, when the water channel to No. 329 and No. 330 broke open again, these wells took some of the water which formerly was pumped from No. 349. Wells Nos. 312 and 313 do not appear to have been noticeably affected.

The amount of oil produced by wells Nos. 329, 330, 348 and 349 has increased approximately 20 bbls, per day, or a total of 80 bbls. per day, since mudding operations were completed in Rancho La Brea No. 41.

The second mudding operation at Rancho La Brea well No. 41 was in progress from November 3 until December 4. A pressure of 400 pounds per square inch was maintained and, during the latter part of November, the well took mud very slowly.

During this time Rancho La Brea Oil Company well No. 38 was shut down. On December 11, when the pumps of well No. 41 were practically "stalled" and the well was taking only a small amount of mud, well No. 38 was put on the pump and began to pump muddy water. Well No. 41 immediately began to take more mud. For three days well No. 38 pumped muddy water, then started to pump a small amount of oil. On December 20 the well was pumping about 50 bbls. of oil per day and no water and mud fluid in well No. 41 stood at the surface.

As mentioned above, the production during April, 1917, for the Salt Lake Oil Company's wells Nos. 329, 330, 347 and 348 was 573 barrels of oil and 4252 barrels of water. In August the production of the same wells after the first mudding operation was 1912 barrels of oil and 1268 barrels of water.

During the second period of mudding operations at Rancho La Brea well No. 41, these wells, as shown by the November production report, produced 2483 barrels of oil and 4693 barrels of water. The amount of water is approximately the same as reported previous to the first mudding of well No. 41, but the quantity of oil has increased 500%.

A study of a cross section showing stratagraphic correlation of points of shut-off in the wells above noted, may throw further light on the reasons for the effects as noted from production reports in the various wells.

Following is a record of fluid levels in the Salt Lake Oil Company wells under discussion:

Fluid Levels From Surface.

Well No. 329	Feb, 16, 1917	1,920′	Aug. 25, 1917	700′	Nov. 1, 1917	900′
In December this well was pumping muddy water and oil.						
Well No. 330	May 11, 1917	603′	Oct. 11, 1917	700′		
Well No. 347	Mar. 13, 1917	800′	Sept. 24, 1917	720′	Dec. 7, 1917	680′
Well No. 348	May 24, 1917	380′	Aug. 22, 1917	500′	Dec. 7, 1917	760′
Well No. 328	June 23, 1917	650′	Sept. 13, 1917	1,180′	Dec. 7, 1917	1,287′
This well pumped sawdust on September 13, 1917.						

CONCLUSIONS.

One factor of great importance in the study of water conditions in this area, as shown by Table No. 1 printed below, is the presence of large quantities of water in certain wells of the Salt Lake Oil Company previous to the penetration of bottom water in Rancho La Brea well No. 41. This well entered bottom water February 23, 1916, and the production reports for wells of the Salt Lake Oil Company shown in the table for the month previous show as much water as the average monthly production for these wells since that time. The total production of oil, however, has been increased one-third for the same period, probably as a result of the mudding operations.

TABLE No. 1.

Monthly Production of Oil and Water, in Barrels, From Wells Adjacent to Rancho La Brea Oil Company Well No. 41.

Company	Well	January, 1916		February, 1917		June, 1917		November, 1917	
		Oil	Water	Oil	Water	Oil	Water	Oil	Water
Salt Lake	276	104	1,636	63	1,036	195	1,305	134	1,206
Salt Lake	312	370	1,171	370	1,171	285	1,615	140	1,260
Salt Lake	313	582	1,182	499	1.013	95	535	114	1,021
Salt Lake	329	389	53	329	45	0	50	630	770
Salt Lake	330	108	342	0	560	0	0	960	640
Salt Lake	346	258	42	245	43	238	10	276	24
Salt Lake	317	149	1.713	212	2,433	0	0	180	1.620
Salt Lake	348	240	197	0	2.025	0	0	713	1,663
Salt Lake	349	394	2,071	325	1,714	440	1,760	410	1,640
Totals		2.594	8,407	2,047	10,040	1,253	5,275	3,557	9.844

From the foregoing, the conclusion may be drawn that Rancho La Brea Oil Company well No. 41 was not the cause of the principal water trouble in adjoining Salt Lake wells. The mudding of this well undoubtedly has bettered the water conditions on the property of the Rancho La Brea Oil Company and has affected the oil production of certain Salt Lake Oil Company wells.

The main source of water trouble on the Salt Lake Oil Company's property in this area, however, antedates the deepening of Rancho La Brea well No. 41, and may later be found in one or more of the wells shown in Table No. 1, or possibly from a well in this vicinity which was drilled through the zone of bottom water and improperly abandoned.

The work of investigation of this condition will be continued and, as it involved a number of wells and not one well as formerly supposed, it may become necessary to construct models and make numerous cross sections before the actual source or sources of the water entering these wells can be determined.

The following tabulation gives the production of oil and water as shown by production reports in barrels per producing well per day of wells adjacent to Rancho La Brea Oil Company well No. 41:

TABLE No. 2.

Company	Well No.	February, 1917		June, 1917		November, 1917	
		Barrels oil	Barrels water	Barrels oil	Barrels water	Barrels oil	Barrels water
Salt Lake	276	3.5	54.5	7.3	49.0	6.1	53.9
Salt Lake	312	16.1	50.9	9.8	55.7	6.1	54.8
Salt Lake	313	20.8	42.2	9.5	53.5	6.3	56.7
Salt Lake	329	15.0	2.0	0	50.0	35.0	42.8
Salt Lake	330	0	31.1	Idle	Idle	34.3	22.9
Salt Lake	346	10.2	1.8	9.2	0.3	9.2	0.8
Salt Lake	347	7.9	90.1	Idle	Idle	6.9	62.3
Salt Lake	348	0	75.0	Idle	Idle	31.0	72.3
Salt Lake	349	13.6	71.4	16.9	67.7	15.2	60.7
Rancho La Brea	20	11.9	0.2	17.5	0.2	15.0	0.2
Rancho La Brea	26	4.4	0	5.4	0	5.2	0.1
Rancho La Brea	31	8.0	0.4	8.9	0.5	6.0	0.6
Rancho La Brea	35	5.0	5.0	5.4	5.4	5.2	5.2
Rancho La Brea	43	Idle	Idle	Idle	Idle	1.5	5.8
Rancho La Brea	44	Idle	Idle	Idle	Idle	Idle	Idle
Totals		116.4	421.6	89.9	282.3	182.0	439.1

NEWHALL FIELD.

GENERAL DESCRIPTION.

All of the developed area in and adjacent to the Santa Susana Mountains, from the Los Angeles-Ventura county line on the west to the region of Newhall and Fernando Pass on the east, is included in the general field name of Newhall. The principal developed areas in this field are situated in Pico, Dewitt, Towsley, Wiley and Rice Cañons, and in Fernando Pass; all of the foregoing on the north slope of the Santa Susana Mountains.

GEOLOGY.

For detailed report on the geology of this field, see U. S. Geological Survey Bulletin No. 309 and Bulletin No. 69 of the California State Mining Bureau.

The producing areas in Pico, Towsley, Wiley and Rice Cañons are confined within narrow limits, along the crest of a well-defined steep dipping anticline in the Vaqueros formation, which is developed on the north slope and parallel with the range of the Santa Susana Mountains. The cañons referred to cut through the anticline transversely and seepages of oil occur from exposed oil sands.

The anticlinal dome, from which production is obtained in Fernando Pass near Newhall, is not connected with structure upon which the other producing areas in this field are located.

Out of a total of about 200 wells drilled in this field, 75 are now producing. According to monthly production reports, this field produced a total of 10,851 bbls. of oil and 9,765 bbls. of water during the month of June, 1917. Reference to Table No. 1 shows that the average daily production in this field is about 5 bbls. of oil and 4 bbls. of water per producing well per day.

Study of map showing relative amounts of water produced by each well shows that there are a comparatively small number of wells in this field which produce clean oil, and that the production of water is fairly evenly distributed throughout the field, with the exception of one well in the eastern portion of this field, which produced about one-third of the total amount of water shown by monthly production reports for the entire field. The owners of this well have commenced drilling a second well, and propose to conduct certain tests to locate, if possible, the source of water entering the first well.

The gravity of the oil in the Elsmere Cañon district ranges from 14-17° Baumé. These wells are drilled in the Fernando formation. The gravity of oil produced in Wiley and Pico Cañons ranged from 25-56° Baumé, and production is probably obtained from the Vaqueros formation.

The following is a list of notices received and decisions rendered during the fiscal year:

Section	Township	Range	Company	New wells		Test of water shut off		Deepen or redrill		Abandon	
				Notices	Decisions	Notices	Decisions	Notices	Decisions	Notices	Decisions
6	3 N	15 W	Tunnel Pet.	1	1	1	1	------	------	------	------
7	3 N	15 W	Standard	1	1	1	1	------	------	1	1
7	3 N	15 W	Dr. P. Bauer	------	------	------	------	------	------	1	1
16	3 N	16 W	Standard	2	2	5	6	------	------	------	------
30	3 N	16 W	Placerita Oil	------	------	1	1	------	------	2	2
2	3 N	17 W	Standard	------	------	1	1	------	------	------	------
			Totals	4	4	9	10	------	------	4	4

The following decisions have been made on proposed well operations:

DECISIONS.

T. 3 N., R. 15 W., S. B. B. & M.

SECTION 6.

Tunnel Petroleum Co.

Well No. 1, drill. CC-129.

Approved decision to commence drilling, prospecting for oil sand before shutting off water.

Well No. 1, shut-off. C-84.

Test of water shut-off approved.

SECTION 7.

Standard Oil Co.

Well No. 21, Elsmere, drill. CC-167.

There was not sufficient information available to indicate the exact depth at which water should be shut off. The proposal to drill this well and locate oil-bearing formations was considered satisfactory by this department.

Well No. 21, Elsmere, shut-off. C-124.

Test of water shut-off satisfactory.

Well No. 21, abandon. CC-224.

The company filed a proposal to abandon this well, stating that certain plugging had been done and tests made, and that, after this work had been done, the well produced 1 bbl. oil and 8 bbls. of water per day.

A study by this department of record of work done by the company showed that certain plugging was done in sand. Recommendations were made by this department to do certain plugging in shale. In carrying out work recommended, the water string was loosened after which the well produced an average of 25 bbls. of oil and 8 bbls. of water per day, indicating that productive formations had formerly been shut off.

Dr. Paul Bauer.

Well No. 2, Nettleton & Killerman, abandon. CC-190.

Approved proposal to abandon. Recommended certain shooting and plugging.

T. 3 N., R. 16 W., S. B. B. & M.

SECTION 16.

Standard Oil Co.

Well No. 26, Wiley, shut-off. C-83.

Test of water shut-off satisfactory.

Well No. 27, drill. CC-201.

Approved estimate of depth for water shut-off.

Well No. 27, Wiley, shut-off. C-156.

The results of the test indicate that 8¼″ casing prevented water above the shut-off point from passing to the lower levels of the well. Approval to continue drilling was given.

Well No. 27, Wiley, shut-off. C-163.

After the well had been deepened below the original shut-off point, it was found necessary to make another shut-off. Test of this shut-off was approved.

Well No. 27, Wiley, shut-off. CC-273.

The company filed a notice stating that they believed water was encountered below the 6¼″ casing. Approved proposal to loosen 6¼″ casing and continue drilling, prospecting for oil sand.

Well No. 27, Wiley, shut-off. C-169.

Water was shut off with 6¼″ casing and test of shut-off approved.

Well No. 28, Wiley, drill. CC-202.

Approved estimate of depth for shutting off water.

Well No. 28, Wiley, shut-off. C-162.

Test of water shut-off approved as satisfactory.

SECTION 30.

Placerita Oil Co.

Well No. 1, abandon. CC-178.

Approved proposal to abandon, indicating depths at which shooting and plugging should be done.

Well No. 2, shut-off. C-110.

Test of water shut-off satisfactory.

Well No. 2, abandon. CC-175.

Records show that oil or gas-bearing formations were not encountered in this well. Approved proposal to remove as much casing as possible. No plugging was required.

T. 3 S., R. 17 W., S. B. B. & M.

SECTION 2.

Standard Oil Co.
Well No. 41, PCO, shut-off. C-92.
Test of water shut-off satisfactory.

MISCELLANEOUS FIELDS.

Dominguez Field: During the past year four new wells were commenced in the vicinity of Long Beach and Compton, in the Dominguez and San Pedro ranchos on the southern extremity of the range of hills of generally low relief extending from Beverly Hills in the Salt Lake field to Signal Hill, Long Beach. The companies operating in this field are the Highland Development Co., the Standard Oil Co., the Union Oil Co., and the General Petroleum Corporation.

No detailed study of the geology of this region has been made by this department.

Inglewood Field: Toward the northern end of the low range of hills upon which the Dominguez field is situated and near the town of Inglewood, the Bartolo Oil Co. commenced drilling a well in August, 1916. Oil in commercial quantities has not been developed up to the present time. Drilling operations are still in progress.

San Fernando Valley: Active development work was not carried on in this field during the past year.

A well drilled by the Crafton Oil Co. in Sec. 1, T. 2 N., R. 15 W., S. B. B. & M., was abandoned and plugged by Mr. L. A. Clampitt.

D. W. Griffith Well No. 1, Section 36, T. 3 N., R. 15 W. This well was drilled to a depth of about 1650′ and abandoned during the month of July, 1916.

Following is a summary of notices received and decisions rendered during the past year, also a list of decisions giving a brief statement relative to work done at each well.

Section	Township	Range	Company	New wells		Test of water shut off		Deepen or redrill		Abandon	
				Notices	Decisions	Notices	Decisions	Notices	Decisions	Notices	Decisions
11	3 S	8 W	F. H. Rowley							1	1
14	11 N	12 W	Mojave Oil							1	1
----	1 S	13 W	I. H. Preston	1							
----	6 S	10 W	W. S. Collins							1	1
----	2 S	10 W	Pet. Dev. Co. (Sentous Rch.)	1	1						
			Dominguez Field—								
19	4 S	12 W	Union Oil	1	1						
----	4 S	13 W	Standard	1	1	1	1	1	2		
----	4 S	13 W	Highland Dev.		1	3		1			
----	4 S	13 W	Gen. Pet.	1	1						
			Inglewood Field								
20	2 S	14 W	Bartolo Oil	1	1		1		1		
			San Fernando Field—								
1	2 N	15 W	Crafton Oil							1	1
1	2 N	15 W	L. A. Clampitt								1
36	3 N	15 W	D. W. Griffith							1	1
			Totals	6	6	4	2	2	3	5	6

DECISIONS.

T. 3 S., R. 8 W., S. B. B. & M.

SECTION 11.

F. H. Rowley.

Well No. 1, abandon. CC-215.

Records filed with this department state that no oil or gas sands were encountered in the well. Approval was given to pull out all casing obtainable. No plugging was required.

T. 2 S., R. 10 W., S. B. B. & M.

Sentous Ranch.

Petroleum Development Co.

Well No. 1, drilling. CC-322.

Recommend that company cement each string of casing landed below 12½" casing.

T. 6 S., R. 10 W., S. B. B. & M.

Irvine Ranch.

W. S. Collins.

Well No. 3, abandon. CC-307.

The work of abandoning was practically completed before "Notice of Intention to Abandon" was filed. Plugging done probably protected the oil-bearing formations from water.

T. 11 N., R. 12 W., S. B. B. & M.

SECTION 14.

Mojave Oil Co.

Well No. 1, abandon. CC-161.

Approved proposal to pull all casing obtainable. According to the log of the well filed, no oil or gas-bearing formations were encountered. Plugging was not required.

T. 4 S., R. 12 W., S. B. B. & M.

SECTION 19.

Union Oil Co.

Well No. 1, Bixby, drill. CC-189.

Recommended that the company cement each string of casing landed. There was no data at hand to show the exact depth at which water should be shut off or the depth at which formations which may contain oil would be encountered.

T. 4 S., R. 13 W., S. B. B. & M.

Rancho San Pedro.

Standard Oil Co.

Well No. 1, Dominguez, drill. CC-153.

Recommended that company cement each string of casing landed in this well in order to be in better position to locate any oil-bearing formations which may be penetrated.

Well No. 1, Dominguez, shut-off. C-120.

Results of test showed that water was not completely shut off. Recommended that company continue drilling and shut off when more favorable formations were encountered.

Well No. 1. Dominguez, redrill. CC-234.

Notice of redrilling received from the company stated that, on account of shifting sand, it was necessary to move the rig and start a new hole and that certain shooting and plugging had been done in the original hole. A representative of the company stated that the showing of oil recorded in the log evidently came from the mud used in drilling and that this mud was hauled from another property. Recommended that the company file additional records relative to the showing of oil recorded in the log.

Well No. 1, Dominguez, redrill. CC-304.

The log of the second hole drilled, near the first one, substantiated the theory advanced by the company relative to the showing of oil recorded in the original hole, and the records were cleared by this decision (Co. CC-304), in which it was stated that the work done at the original hole was accepted by this department as satisfactory. At the present time drilling is being continued in the second hole.

Highland Development Co.

Well No. 1, Dominguez, continue drilling. CC-330.

An attempt which was made to make a formation shut-off with 8¼″ failed to shut off water. Approved proposal to continue drilling, prospecting for an oil sand, with 6¼″ casing.

General Petroleum Corp.

Well No. 1, Dominguez, drill. CC-193.

Approved proposed plan of cementing 12½″ casing and other casing when found necessary.

Well No. 1, commence drilling. CC-133.

Approved proposal to commence drilling. The notice of intention to commence drilling stated that water should be shut off at about 2000′. No recommendation relative to depth at which water should be shut off was made on account of this being a prospect well.

T. 2 S., R. 14 W., S. B. B. & M.

SECTION 20.

Bartolo Oil Co.

Well No. 1, shut-off. C-128.

Test of water shut-off with 12½″ casing approved.

Well No. 1, deepen and recement. CC-290.

The 8¼″ casing which was cemented failed to shut off water. Approved proposal to deepen, prospecting for oil-bearing formations.

T. 2 N., R. 15 W., S. B. B. & M.

SECTION 1.

Crafton Oil Co.

Well No. 1, abandon. CC-197.

Approved proposal to abandon. Recommended shooting and certain plugging with cement. Required affidavits giving names and addresses of all workmen engaged in abandoning the well, and record of work done in abandoning.

L. A. Clampitt.

Well No. 1, Crafton, abandon. CC-225.

L. A. Clampitt purchased the equipment at Crafton Well No. 1. Approved proposal to remove certain casing and conduct tests for determining the amount of oil which this well would produce. Affidavit was furnished, giving record of work done in abandoning this well, according to our decision CC-197.

T. 3 N., R. 15 W., S. B. B. & M.

SECTION 36.

David W. Griffith.

Well No. 1, abandon. CC-126.

Certain work at this well previous to abandonment was not done in compliance with the law governing such work.

This well was abandoned before the log record had been filed and before this department had had an opportunity to make an investigation. Log records filed subsequent to completion of abandonment work, showed that oil-bearing formations were not encountered in this well.

VENTURA COUNTY.

DISTRICT No. 2.

Previous publications of the State Mining Bureau have described in detail the pioneer days of the oil industry in the Ventura oil district, together with general descriptions of the geology of these districts and the developments up to and including the year 1916. For such detailed description, reference may be made to Geology of California, Vol. II, 1882, by Peckham, California State Mining Bureau Bulletin 11 by Watts, U. S. Geol. Survey Bulletin No. 309, covered by Eldredge, California State Mining Bureau Bulletin No. 63 by Prutzman, and California State Mining Bureau Bulletin No. 69 by McLaughlin.

The intense folding and faulting which has disturbed this region is responsible for the scattering of oil deposits into so many parts of the territory. In no other district of the state is production obtained from so many minor folds and from so many geologic horizons as in the districts under discussion. All geologic formations present in this region from the Tejon, or upper Eocene, to the Fernando, of Pliocene age, are petroliferous and contain oil horizons which are productive in the different fields, where penetrated.

Ventura County has been divided into eight separate fields for mapping and descriptive purposes, and the features characterizing this classification are mainly topographic features. The names of the fields have been supplied and are in general use by the oil operators in Ventura County.

The number of wells in this district, number of producing wells, number of logs filed, number of graphic logs, average daily production of oil and water, percentage of water, number of acres of proved oil land, average daily amount of oil produced per acre during June, are shown by fields in the following tabulation:

TABLE No. 3.

Field	Wells listed	Logs filed	Graphic logs	Number wells accounted for by production reports	Number wells actually producing according to production reports	Average daily production		Average daily production per producing well		Percentage of water	Proved oil land	
						Barrels oil	Barrels water	Barrels oil	Barrels water		Acreage	Average daily production per acre
Simi	38	23	0	20	20	197	19	9.8	1	8.8	138	1.4
Piru	167	16	0	71	70	370	462	5.3	6.6	56.2	427	.86
Bardsdale	156	136	13	128	126	1,657	165	13.1	1.3	9.1	280	5.92
Sespe	131	44	0	29	29	108	93	3.7	3.2	46.3	239	.45
South Mountain	9	8	0	4	4	134	0.4	33.5	0.1	0.3	40	3.35
Santa Paula	131	7	0	45	34	104	46	3.1	1.4	30.5	100	1.04
Ojai	119	29	0	62	59	146	29	2.5	0.5	16.6	297	.49
Ventura	6	6	6	1	1	12	240	12	240	95.4	10	1.2
Totals	757	269	19	360	343	2,728	1,054.4	7.9	3.1	27.9	1,531	1.7

The following table gives a summary of written notices received and decisions made in this district during the past year.

TABLE No. 4.

Field	New wells		Test of water shut off		Deepen or redrill		Abandon	
	Notices	Decisions	Notices	Decisions	Notices	Decisions	Notices	Decisions
Simi			1	2	1	1	2	2
Piru	1	5	2	2				
Bardsdale	9	10	29	23	6	4	3	3
Sespe	3	2					3	3
South Mountain	9	9	13	6	1	1	1	1
Santa Paula	4	4	1	1	1	1	2	2
Ojai	3	4	2	2	2	2		
Ventura	9	9	2	3	1	3	2	2
Miscellaneous						1		
Totals	38	43	50	39	12	13	13	13

SIMI FIELD.

The territory mapped as the Simi Field includes the valley of Simi, together with the slopes of the Santa Susana and Simi ranges, which flank the valley on all sides. It is bounded on the east by the Los Angeles-Ventura county boundary line, and includes the major portions of Townships 2 and 3 North, Ranges 17 W., 18 W., and 19 W., S. B. B. & M. The Simi field may further be extended, if warranted by future developments, to include the valley of Moorpark and Somis, lying to the west and a natural extension of the Simi Valley.

PRODUCTION AND WATER CONDITIONS.

The production of the twenty producing wells in this field for the month of June, 1917, amounted to about 5,919 bbls. of oil and 580 bbls. of water, or a daily average of 197 bbls. of oil and 19 bbls. of water per well per day.

The proved oil land in this field amounts to about 138 acres. Recent drilling operations begun by the Doheny-Pacific Petroleum Company may increase the area of proved land materially during the coming year.

Summary of notices received and list of decisions rendered during the fiscal year follows:

Section	Township	Range	Company	New wells		Test of water shut off		Deepen or redrill		Abandon	
				Notices	Decisions	Notices	Decisions	Notices	Decisions	Notices	Decisions
36	3 N	18 W	Doheny-Pac. (Petrol Co.)	------	------	1	2	1	1	------	------
36	3 N	18 W	Midway Simi	------	------	------	------	------	------	1	1
33	3 N	18 W	Cal. Profit Sharing	------	------	------	------	------	------	1	1
			Totals	------	------	1	2	1	1	2	2

Following is a list of all decisions rendered covering operations at wells in this field for the past year, accompanied by brief descriptions showing the character of work done at each well included in the list and recommendations made by this department.

DECISIONS.

T. 3 N., R. 18 W., S. B. B. & M.

SECTION 36.

Doheny-Pacific Petroleum Co.

Well No. 3 (Petrol), deepen. Letter 8/3/16.

Approved proposal to deepen, prospecting for lower oil-bearing formations.

Well No. 3, shut-off. C-179.

The results of the test showed that water encountered near the bottom of the well had been successfully plugged off.

Well No. 15, shut-off. C-115.

Test of water shut-off approved.

Midway Simi Oil Co.

Well No. 1, abandon. CC-140.

Approved proposal to abandon. Recommended that shooting and plugging be done between certain specified depths.

T. 3. N., R. 19 W., S. B. B. & M.

SECTION 33.

California Profit Sharing Oil Co.

Letter Nov. 24, 1916.

Certain casing was removed from the well before this department had an opportunity to issue a decision and before the time for issuance of such decision had expired. Mr. C. W. Fox, Trustee, filed an affidavit relative to the sale of certain casing to Mr. E. A. Clampitt. An investigation of the case was made by the supervisor which showed that the well was left in such condition as to not damage surrounding territory by flooding oil sands with water.

PIRU FIELD.

The Piru Field takes its name from the town of Piru, which is located in the Santa Clara Valley on a coast line branch of the Southern Pacific Railroad. This field includes all development lying in and adjacent to Torrey, Eureka, Tapo and Hopper Cañons, and Piru Creek, in which region also are those portions of the Ranchos San Francisco and Temescal, lying in Ventura County. The field is bounded on the east by the Los Angeles-Ventura county line and on the west by a north and south line drawn from the northwest corner of Section 2, T. 5 N., R. 19 W., to the Santa Clara River on the west line of Section 35, T. 4 N., R. 19 W.

The production in this field is obtained mainly from Miocene formation of Vaqueros and Monterey ages, and the structure is complicated by intense folding along east and west lines. Producing wells are confined to the apices and flanks of the steep dipping anticlines as exposed in the cañons cutting across them, and is terminated to the west by the north-south fault which forms the drainage basin of Hopper Cañon.

PRODUCTION.

Reference to Table No. 3 shows that there were 70 producing wells in this field during June, 1917, with an average daily production of 370 bbls. of oil and 462 bbls. of water for the field, or an average of 5.3 bbls. of oil and 6.6 bbls. of water per producing well per day. One group of 7 wells in this field produced 205 out of 462 bbls. average daily production of water for the entire field.

The water conditions in certain portions of this field are serious. A number of wells are now idle because the cost of lifting the water produced by these wells does not allow for a profitable operation of the wells.

It seems advisable and necessary to plug and abandon some of these wells in order to protect the territory from water. In some cases the amount of salvaged material would more than pay for the cost of necessary plugging.

Active drilling operations were carried on at three wells in Eureka Cañon, Section 34, T. 4 N., R. 18 W., without developing oil in paying quantities.

The following summary of notices received and decisions rendered during the fiscal year shows that there has been little activity in new development during the fiscal year.

List of official decisions giving a statement relative to recommendations made by this department is also given.

Section	Township	Range	Company	New wells		Test of water shut off		Deepen or redrill		Abandon	
				Notices	Decisions	Notices	Decisions	Notices	Decisions	Notices	Decisions
33	4 N	18 W	Winnipeg	------	------	1	1	------	------	------	------
34	4 N	18 W	Eureka Canon Syndicate	------	4	1	1	------	------	------	------
13	4 N	19 W	Ventura Pac.	1	1	------	------	------	------	------	------
			Totals	1	5	2	2	------	------	------	------

DECISIONS.

T. 4 N., R. 18 W., S. B. B. & M.

SECTION 8.

Diamond Valley Oil Co.

Well No. 4, commence drilling. CC-243.

Approved proposed depth for shutting off water.

SECTION 33.

Winnipeg Oil Co.

Well No. 3, shut-off. C-130.

The results of test of water shut-off were satisfactory. Recommend that well be put on pump for 90 days for further test.

SECTION 34.

Eureka Canon Syndicate.

Well No. 2, shut-off. C-66.

Test of water shut-off approved.

Well No. 3, test water string. CC-166.

When testing water shut off the well was drilled 17′ below the water string and water rose to within 100′ of the surface. Recommended that company test water string by bridging below it with cement.

Well No. 3, make production test. CC-217.

After failing to shut off water with the 6¼″ casing, this casing was shot off and the 8¼″ casing loosened and cemented at 1169′, and failed to shut off water. Approved proposal to put in 6¼″ casing and make a pumping test. The results of this test indicated that water was probably entering the well below the shut-off point.

Well No. 3, re-cement. CC-238.

Approved proposal to cement 6¼″ casing at a depth of about 1250′.

T. 4 N., R. 19 W., S. B. B. & M.

SECTION 13.

Ventura-Pacific Oil Co.

Well No. 6, drill. CC-302.

There was not sufficient information available at the time this decision was written to indicate the depth at which water should be shut off. The company did not file further information, possibly on account of same not being available.

BARDSDALE FIELD.

The limits of this field are defined by a recent classification of the State Mining Bureau as the Santa Clara River on the north, the crest of Oak Ridge on the south, and from Sulphur Cañon on the west to the township line between Ranges 18 and 19 W. on the east. It includes the following active operating oil companies: Montebello, Calumet and Home Ranch Petroleum, John Barneson, Union Oil, Bardsdale Crude and West Huasna and Bell Oil companies.

GENERAL GEOLOGY.

According to previous publications of the State Mining Bureau, Oak Ridge, the prominent topographic feature of the field, represents a portion of the south flank of an anticline which parallels and lies immediately south of the Santa Clara Valley, trending nearly east and west. The southern flank of Oak Ridge and of the anticline dips uniformly under the Simi Valley and the northern slope of the anticline is almost completely buried and masked under the low range of hills on the south side of Santa Clara Valley. The formations exposed on the surface in this field include beds of Sespe, Vaqueros and Monterey age.

Sections 3 and 4, T. 3 S., R. 19 W.: Wells drilled on the property of the Montebello, Calumet and Home Ranch Petroleum companies in Sections 3 and 4, T. 3 S., R. 19 W., penetrate and produce from the Sespe and possibly Tejon formations. Three well-defined oil zones have been encountered on the property of the Montebello Oil Co., and two on the Calumet and Home Ranch Petroleum companies, the first zone being unproductive on the latter properties.

Two well-defined zones carrying salt water have also been penetrated on these properties. The first water zone lies between the first and second oil zones, and the lower salt water lies between the second and third oil zones.

PRODUCTION AND WATER CONDITIONS.

Log records and monthly reports of wells drilled in Sections 3 and 4, T. 3 S., R. 19 W., show that there were 68 wells which obtained production from the first oil zone only. These wells averaged about 5 bbls. of oil and 1.6 bbls. of water per day.

Twenty-one wells obtained production from the second zone only, and averaged about 60 bbls. of oil and 2.3 bbls. of water per day during the month of June, 1917.

The first well was completed at a depth of 650′, in April 1911, and produced from the first zone only. The first well producing from the second zone was completed in June, 1914, at a depth of about 1800′, and is located in the east half of Section 4.

The first zone has been protected in this field throughout its productive area. This was done by shutting off water above this zone and below this zone above the intermediate salt water between the first and second zones, by wells penetrating the second zone. In the latter wells another shut-off was made below the intermediate water between these zones and above the second oil zone. This necessitated the use of three water strings by wells producing from the second zone.

Water below the second oil zone was encountered in seven wells and successfully plugged off.

The third oil zone in this area has only recently been encountered in drilling, and the importance of this zone for production has not been demonstrated. The gravity of oil in this zone is about 37° Baumé. This zone underlies the salt water below the second oil zone.

A study of production reports received from companies operating in this area shows that the care exercised by operators in the matter of protecting oil bearing formations from water has resulted in a small production of water per well. The employment of scientific methods in the study of the underground structure by one of the large companies (Montebello Oil Co.) in this area, which included the construction of a peg model and cross-sections of wells on their property, no doubt has aided in the efficient development of this property.

Sections 6 and 7, T. 3 S., R. 19 W., and Sections 1 and 12, T. 3 S., R. 20 W.: This area embraces development in and adjacent to Grimes Cañon.

Monthly production reports filed with this department for the month of June, 1917, show 34 producing wells for this area. These reports have been received from all operators except the Bell Oil Company. The total monthly production shown by these reports for June amounted to about 2,000 bbls. of oil and 151 bbls. of water. It is interesting to note that a number of wells were drilled 20 to 25 years ago and are still producing a small quantity of oil. The gravity of the oil produced averages 27° Baumé.

Following is a summary of notices received and decisions rendered:

Section	Township	Range	Company	New wells		Test of water shut off		Deepen or redrill		Abandon	
				Notices	Decisions	Notices	Decisions	Notices	Decisions	Notices	Decisions
3	3 N	19 W	Home Ranch Petr. Co.	1	1	------	1	------	------	------	------
3	3 N	19 W	Calumet Oil	1	1	------	1	1	1	------	------
4	3 N	19 W	Montebello	5	6	28	19	3	2	2	2
5	3 N	19 W	Montebello	1	1	1	1	------	------	------	------
7	3 N	19 W	John Barneson	------	------	------	1	1	------	1	1
12	3 N	20 W	Bardsdale Cr.	------	------	------	------	1	1	------	------
12	3 N	20 W	Union Oil	1	1	------	------	------	------	------	------
			Totals	9	10	29	23	6	4	3	3

Official decisions were made for wells in this field as follows:

DECISIONS.

T. 3 N., R. 19 W., S. B. B. & M.

SECTION 3.

Calumet Oil Co.

Well No. 2, deepen. CC-226.

The notice of intention to deepen stated that the well was free from water. Approved proposal to deepen.

Well No. 7, shut off. C-178.

A formation shut-off was made with 10″ casing. Production test after well was completed indicated that water from above the shut-off point was not passing to lower levels in the well. Shut-off test satisfactory.

Well No. 9, drill. CC-284.

Approved proposed depth for shutting off water.

Home Ranch Petroleum Co.

Well No. 1, drill. CC-191.

The company proposed to shut off water at a depth of 250′. This department recommended that water be shut off at a depth of about 1250′.

Well No. 1, shut off. C-145.

Water was shut off at a depth of 1213′ and test of shut-off approved.

T. 3 N., R. 19 W., S. B. B. & M.

SECTION 4.

Montebello Oil Co.

Well No. 102., shut-off. C-126.

Test of water shut-off for the 10″ casing cemented at a depth of 1173′ approved as satisfactory.

Well No. 109, Shiels, shut-off. C-119.

15½″ casing cemented at a depth of 536′. Salt water plugged off in bottom of hole. Test of water shut-off approved as satisfactory.

Well No. 109, shut-off. C-134.

Test of water shut-off for the 12½″ casing approved as satisfactory.

Well No. 113, drill. CC-125.

Approved proposal of the company to shut off water at a depth of about 600′.

Well No. 113, shut-off. C-103.

Approved test of water shut-off for 15½″ casing cemented at a depth of 359′.

Well No. 113, shut-off. C-140.

Approved test of water shut-off for the 12½″ casing.

Well No. 114, drill. CC-320.

Approved proposal to shut-off water at a depth of about 350′.

Well No. 98, shut-off. C-75.

Test of water shut-off for the 15½″ casing approved as satisfactory.

Well No. 98, shut-off. C-86.

Test of water shut-off for the 12½″ casing approved as satisfactory.

Well No. 98, shut-off. C-102.

Test of water shut-off for the 10″ casing approved as satisfactory.

Well No. 101, drill. CC-319.

Approved proposal of the company to shut off water at a depth of about 300′.

Well No. 102, drill. CC-124.

Approved proposal of the company to shut off water at a depth of about 1000′.

Well No. 102, shut-off. C-93.

Test of water shut-off for the 12½″ casing cemented at a depth of 1000′ approved as satisfactory.

Montebello Oil Co.

Well No. 88, abandon. CC-281.

The hole was crooked and well abandoned Oct. 28, 1915, by plugging with cement at depths of 645, 410 and 370′. The work of abandoning was not done under the supervision of this department, but the cement plugs are probably effective. Record of work done was furnished by the company in order to complete the files of this department.

Well No. 89, shut-off. C-63.

Test of water shut-off with 12½″ casing approved as satisfactory.

Well No. 90, abandon. CC-115.

Approved proposal of the company to abandon this well, due to twisting off of drill pipe. Proposed shooting and plugging at certain depths and moving the rig about 40′ to redrill with rotary outfit, was also approved.

Well No. 97, shut-off. C-175.

A production test was witnessed at this well for the reason that notice of test of water shut-off had not been received by this department for the 8¼″ casing, before the well was completed. The results of production test indicated that water from above a depth of 2291′ is not passing to lower levels in the well.

Well No. 85, shut-off. C-85.

Test of water shut-off approved as satisfactory.

Well No. 85-A, shut-off. C-112.

Approved test of water shut-off for 10″ casing cemented at 1182′.

Well No. 85-A, shut-off. C-177.

Production test witnessed by this department showed that water was successfully plugged off from entering at the bottom of the well and that the 10″ water string excluded water from above a depth of 1182′. Test approved as satisfactory.

Well No. 87, drill. CC-250.

Approved the company's proposal to shut off water at a depth of about 350′.

Well No. 87, shut-off. C-160.

Test showed that water was not entering the well from above a depth of 338′.

Well No. 87, re-cement. CC-287.

Approved proposal of the company to cement the 12½″ casing at a depth of about 550′ using sufficient cement to extend from the bottom of the hole to the surface to protect an upper oil zone which was found to contain water.

Well No. 25, shut-off. C-71.

The results of the test indicated that water which entered the well from the bottom had been successfully shut off.

Well No. 55, redrill. CC-260.

Approved proposal to take out a portion of the oil string which was plugged with bailer and tools.

Well No. 77, deepen. CC-280.

The company filed notice of deepening this well after the work had been completed. This was done in order to complete the files.

Well No. 77, shut-off. C-176.

The results of test showed that water above the last cementing point was not passing to lower levels in the well. Test approved.

Well No. 81, shut-off. C-114.

Test of water shut-off satisfactory.

Well No. 85, shut-off. C-96.

Test of water shut-off approved as satisfactory.

SECTION 5.

Montebello Oil Co.

Well No. 1, Elkins, drill. CC-246.

Approved proposed depth for shutting off water. This is a prospect well and there was not sufficient information available to indicate the exact depth at which water should be shut off.

Well No. 1, Elkins, shut-off. C-188.

Water was shut off at about the depth planned by the company and test of shut-off approved.

SECTION 7.

Barneson et al.

Well No. 1, Ventura Lease, shut-off. C-90.

The results of the test did not definitely show that all water was shut off. Recommended that the company proceed with drilling and make another shut-off at a lower depth, if necessary.

John Barneson.

Well No. 1 (Boston Sonora), abandon. CC-275.

Approved proposal to remove casing and shoot and plug with cement between certain depths. Record of work done in abandoning has not been filed with this department.

T. 3 N., R. 20 W., S. B. B. & M.

SECTION 12.

Union Oil Co.

Well No. 15, drill. CC-163.

Data at hand did not furnish sufficient information as to the depth at which water-bearing formations should be encountered. Notice stated that this well was to be a test well and that the depth to water was unknown. Recommended that the well be drilled in such a manner as to protect from water, oil-bearing formations from which adjoining wells are producing.

Bardsdale Crude Oil Co.

Well No. 5, deepen. CC-181.

SESPE FIELD.

This field includes most of the territory drained by the Sespe Creek and its tributaries among which are Pine Creek, Coldwater Cañon, Tar Creek, Fourfork Creek, Centennial Creek, Little Sespe Creek, and also the region comprising the draining of Pole Cañon. The Sespe field adjoins the Piru field on the west. The Santa Clara River is its southern boundary. It includes all of T. 5 N., R. 20 W., the easterly $\frac{2}{3}$ of T. 4 N., R. 20 W., and the westerly $\frac{2}{3}$ of T. 4 N., R. 19 W., and T. 5 N., R. 19 W.

GENERAL GEOLOGY.

The structure of the Sespe Field is probably as complex as any structure with which oil production is associated in Ventura County. In general, the structure is of the fault block type, the formation having been faulted up in a north-south direction along a line which is followed roughly by the Big Sespe Creek, the strata dipping away from the fault zone east and southeast of Hopper Cañon, where the block faulting is duplicated. Consequently, the beds exposed by erosion in an east-west section through the middle of the field represent successive formations of Sespe to Puente ages. This fault block is complicated by highly compressed folding in the northwest-southeast direction.

Production is obtained mainly from oil sands of Sespe and Vaqueros formations, and followed lines of seepage from these formations, being influenced primarily by the position of transverse folds and the general eastward dip of the formations.

PRODUCTION AND WATER CONDITIONS.

The production obtained from this field is of relatively small importance at the present time. Reference to Table No. 3 shows that 131 wells have been drilled in this field, of which only 29 were producing in June, 1917. These wells average about 4 bbls. of oil and 3 bbls. of water per day each, during this month.

Some of these wells have been producing for nearly 30 years.

During the past year 2 new wells were drilled and 3 old wells abandoned, as shown by the following tabulation:

Section	Township	Range	Company	New wells		Test of water shut off		Deepen or redrill		Abandon	
				Notices	Decisions	Notices	Decisions	Notices	Decisions	Notices	Decisions
19	4 N	19 W	Gr. Rep. Oil & Paint Co.							1	1
33	5 N	19 W	White Star	1	1					1	1
1	4 N	20 W	Kentuck Oil	1	1						
19	5 N	20 W	J. C. Anderson							1	1
			Totals	2	2					3	3

Record of official decisions follow herewith:

DECISIONS.

T. 4 N., R. 19 W., S. B. B. & M.

Section 19.

Great Republic Oil & Paint Co.

Well No. 1, abandon. CC-274.

The original log of this well was lost. The information filed by the company was indefinite and conflicting. Recommended plugging with cement between certain depths.

T. 5 N., R. 19 W., S. B. B. & M.

Section 33.

White Star Oil Co.

Well No. 15, abandon. CC-264.

Notice of intention to abandon this well was received on *April 11, 1917*, and the work of abandonment had been completed on *April 9, 1917*. This work was not done under the supervision of this department and future developments may indicate that this well was not properly plugged.

Well No. 16, drill. CC-240.

Approved proposal of the company to shut off water at a depth of about 600′.

T. 4 N., R. 20 W., S. B. B. & M.

Section 1.

Kentuck Oil Co.

Well No. 7, drill. CC-340.

Approved proposal of the company to shut off water at a depth of about 100′.

T. 5 N., R. 20 W., S. B. B. & M.

SECTION 19.

J. C. Anderson.

Well No. 1, abandon. CC-139.

Recommended that if the 10″ casing was removed the hole be plugged with cement.

SOUTH MOUNTAIN FIELD.

GENERAL DESCRIPTION.

The South Mountain field is located on the south side of the Santa Clara Valley, taking in the mountain range known as South Mountain, and extending from Sulphur Cañon and the Bardsdale field, on the east, to the subsidence of the range under the Santa Clara Valley to the west.

The geology of this region has been described in Bulletin No. 309 of the U. S. Geological Survey and in California State Mining Bulletin No. 69. The structure of the present developed area in this field is anticlinal. The present producing wells are located near the apex of this anticline, and penetrate formations of probable Vaqueros and Sespe age.

HISTORY OF DEVELOPMENT.

The United Oil Company commenced drilling the first well in this field on November 4, 1915. This well was located in the S.E. ¼ of Section 17, T. 3 N., R. 20 W., and was drilled to a depth of 3800′, and, according to the log record, no oil-bearing formations were encountered. The well was abandoned in June, 1917.

Drilling was commenced at the second well by the Santa Paula Oil Association in June, 1916, and completed at a depth of 732′ on July 24, 1916. This well is located near the center of the north line of the S. W. ¼ of Section 18, T. 3 N., R. 20 W., S. B. B. & M. Productive oil sands were encountered in this well at a depth of 480′. By June, 1917, there were four wells completed and producing in this field. Various oil sands have been penetrated between depths of about 500′ and 3000′. During the fiscal year notices of intention to commence drilling nine wells were received. Drilling operations in this field were confined to Sections 17 and 18, T. 3 N., R. 20 W., and Section 13, T. 3 N., R. 21 W., and were carried on by the United Oil Co., Santa Paula Oil Co., and the Oak Ridge Oil Co.

PRODUCTION AND WATER CONDITIONS.

Reference to Table No. 3, shows that there were 4 producing wells, making an average of 23.5 bbls. of oil and .1 bbl. of water per well per day during the month of June, 1917. The oil produced by these wells averaged about 26° Baumé. Water has been effectively excluded in each of these wells.

FUTURE DEVELOPMENTS.

The recent increase in production in this field has resulted from the deepening of wells which formerly produced from an upper oil horizon. The production of wells producing from the lower horizon may probably be increased by further deepening.

Present developments indicate that the proved area of this field will be extended by the drilling of new wells.

The following summary shows the area in which active developments were carried on in the past year in this field:

Section	Township	Range	Company	New wells		Test of water shut off		Deepen or redrill		Abandon	
				Notices	Decisions	Notices	Decisions	Notices	Decisions	Notices	Decisions
17	3 N	20 W	United Oil	1	1	2	1	------	------	1	1
18	3 N	20 W	Santa Paula Oil Assn.	1	1	2	1	1	1	------	------
18	3 N	20 W	Oak Ridge Oil	5	5	4	1	------	------	------	------
13	3 N	21 W	Oak Ridge Oil	2	2	5	3	------	------	------	------
			Totals	9	9	13	6	1	1	1	1

A list of decisions relative to operations at various wells is given below:

DECISIONS.

T. 3 N., R. 20 W., S. B. B. & M.

SECTION 17.

United Oil Co.

Well No. 1, shut-off. C-152.

Test of water shut-off for 6¼″ casing cemented at a depth of 3093′ approved as satisfactory.

Well No. 1, drill. CC-218.

Study of data at hand did not indicate the exact depth at which water should be shut off. The notice stated that the company did not know the depth at which water should be shut off. Recommended that the question of shut-off be taken up before landing a string of casing for water shut-off.

Well No. 1, abandon. CC-308.

Records filed with this department do not show any oil or gas-bearing formations to have been encountered in this well. Approved proposal to plug the well between certain depths and remove as much casing as possible.

SECTION 18.

Oak Ridge Oil Co.

Well No. 1, Willard, drill. CC-131.

Approved proposal of the company to shut off water at a depth of about 500′.

Well No. 2, Willard, drill. CC-220.

Approved proposal of the company to shut off water at a depth of about 600′.

Well No. 2, Willard, shut-off. C-167.

Test of water shut-off for the 10″ casing approved as satisfactory.

Well No. 3, Willard, drill. CC-219.

The proposal of the company to shut off water at a depth of about 510′ approved as satisfactory.

Well No. 5, Willard, drill. CC-259.

Approved proposal of the company to shut off water at a depth of about 500′.

Well No. 4, Willard, drill. CC-258.

The proposal to shut off water at a depth of about 500′ was approved.

Santa Paula Oil Association.

Well No. 2, drill. CC-130.

Approved proposal of the company to shut off water at a depath of about 700′.

Well No. 2, shut-off. C-170.

The failure of the company to file notice for test of water shut-off before the well was completed and producing from the first oil zone, necessitated a production test at this well. A production test was witnessed and approved.

Well No. 1, deepen. CC-291.

Approved proposal to deepen the well to increase production.

T. 3 N., R. 21 W., S. B. B. & M.

SECTION 13.

Oak Ridge Oil Co.

Well No. 1, shut-off. C-111.

Test of water shut-off for 12½″ casing approved.

Well No. 1, Harvey, drill. CC-237.

Approved a proposal of the company to shut off water at a depth of about 350′.

Well No. 1 Y.R., shut-off. C-78.

Approved test of water shut-off with the 15½″ casing.

Well No. 1 Y.R., shut-off. C-117.

Approved test of shut-off with the 12½″ casing.

Well No. 1 Y.R., recement. CC-279.

After cementing the 12½″ casing five times, it was found that, although the cement had set each time, water was coming in presumably at the casing joints. The proposal to put in the 10″ casing and prospect ahead for oil sands was approved.

SANTA PAULA FIELD.

GENERAL DESCRIPTION.

This field includes the eastern one-half of the Rancho Ex-Mission, with the developed areas situated at the heads of Aliso, Wheeler, Salt Marsh, and Adams Cañons, on the south slope of Sulphur Mountain and the area adjacent to and east of Santa Paula Creek, as far as Timber Cañon. The southern limit of the field is the Santa Clara River.

Productive areas in this field are confined principally to narrow zones which follow the trend of faulting which is responsible for the formation of Sulphur Mountain and Santa Paula Ridge.

The western portion of the field, which lies at the foot of Sulphur Mountain, was developed by the Union Oil Company many years ago. No further prospective developments are recorded in this area during the past year.

Along the eastern extension of the field, and following the fault at the southern base of Santa Paula Ridge, four new wells commenced drilling during the fiscal year. The results obtained by drilling these wells will, in a large measure, determine the extent of further developments in this portion of the field.

PRODUCTION AND WATER CONDITIONS.

During the month of June, 1917, there were 34 producing wells in this field, according to the production reports received by this department. These wells averaged about 3 bbls. of oil and 1.5 bbls. of water per well per day during this month. A number of companies operating in this field have been dilatory in filing monthly production reports. Production reports received from one company, in which a report was made that wells on this property produced no water, are known to be at variance with the facts in this case.

The average daily production of producing wells in this field is small, but the life of the individual well is greater than the average producing well in other fields in the state.

A summary of notices received and decisions rendered for the fiscal year follows:

Section	Township	Range	Company	New wells		Test of water shut off		Deepen or redrill		Abandon	
				Notices	Decisions	Notices	Decisions	Notices	Decisions	Notices	Decisions
18	4 N	20 W	Timber Canyon Syndicate	1	1	------	------	------	------	------	------
20	4 N	20 W	Santa Clara Oil & Dev.	1	1	1	1	------	------	------	------
13	4 N	21 W	Empire Oil	------	------	------	------	------	------	1	1
15	4 N	21 W	Amer. Vent.	1	1	------	------	------	------	------	------
21	4 N	21 W	Slocum Oil	------	------	------	------	1	1	------	------
22	4 N	21 W	Amer. Vent.	1	1	------	------	------	------	1	1
			Totals	4	4	1	1	1	1	2	2

Detailed list of decisions and character of work done in the field for the past fiscal year follows:

DECISIONS.

T. 4 N., R. 20 W., S. B. B. & M.

Section 18.

The Timber Cañon Syndicate.

Well No. 1, drill. CC-222.

Approved proposal of the company to shut off water at a depth of about 300′.

Section 20.

Santa Clara Oil and Development Co.

Well No. 1, drill, CC-188.

The notice from the company stated that the depth at which water-bearing formations should be encountered was unknown. Recommended that water be shut off with each string which was landed.

Well No. 1, shut-off. C-138.

Test of water shut-off for 12½″ casing landed at a depth of 143′ was approved as satisfactory.

T. 4 N., R. 21 W., S. B. B. & M.

SECTION 13.

Empire Oil Co.

Well No. 3, abandon. CC-321.

Approved proposal of the company to abandon the well, specifying plugging with cement between certain depths and determination to be made that cement plugs set properly before removal of casing.

SECTION 15.

American Ventura Oil Co.

Well No. 2, drill. CC-233.

Approved proposal of the company to shut off water at a depth of about 400′.

SECTION 21.

Rancho Ex-Mission, Tracts "A" and "S"

Slocum & Co.

Well No. 1, deepen. CC-180.

Proposal of the company to deepen the well 250′ was approved.

SECTION 22.

American Ventura Oil Co.

Well No. 6, abandon. CC-192.

Recommended plugging the well with cement between certain depths, and determination to be made that cement plugs set properly before proceeding.

Well No. 10, drill. CC-232.

Notice from the company stated that water-bearing formations should be encountered at a depth of about 450′. Study of available data indicated that water should be shut off somewhere between a depth of from 400′ to 500′.

OJAI FIELD.

For the purpose of mapping and for convenience in filing of records, the Ojai field has been described by this department as including all of the area lying in the Rancho Ojai from the Ventura River on the west to the Santa Paula Creek on the east, and all of the area lying north of this ranch as far as the northerly boundary of Township 4 North.

The operating companies which were actively engaged in development of this field during the past year include the Pan-American Petroleum Co., the Great Republic Oil & Paint Co., Capitol Crude Oil Co., Santa Maria Crude Oil Co., and the West American Oil Co. As in the Santa Paula field to the south, the productive areas in this field are associated with the regions of faulting and attendant upon the uplift which has formed Sulphur Mountain and minor folding which has developed along the fault zones.

Development during the fiscal year has been confined to old known producing areas, and the proven area has not been extended. Table No. 3 shows 297 acres of proved oil land for the year 1916–17.

PRODUCTION AND WATER CONDITIONS.

According to information shown on monthly production reports, the water condition of wells producing in this field is not serious. The average daily production for the month of June, 1917, for the entire field was 146 bbls. of oil and 29 bbls. of water, or an average of 2.5 bbls. of oil and .5 bbls. of water per producing well per day.

Out of a total of 119 wells shown to have been drilled in this field, only 29 are now producing. Many of these wells were abandoned without penetrating productive oil sands and many have been abandoned on account of low production of oil.

The recent acquisition of large holdings of prospective oil land by the Pan-American Petroleum Co., and the number and distribution of wells started by this company at present writing, indicate that this field will be more thoroughly prospected during the coming year than for many years previous.

The following summary of notices received and decisions rendered shows the areas in which development has been active during the fiscal year:

Section	Township	Range	Company	New wells		Test of water shut off		Deepen or redrill		Abandon	
				Notices	Decisions	Notices	Decisions	Notices	Decisions	Notices	Decisions
8	4 N	21 W	Gr. Republic Oil & Paint Co.	1	1	------	------	------	------	------	------
17	4 N	21 W	Capitol Crude	1	2	1	1	------	------	------	------
11	4 N	22 W	Pan-Amer. Pet.	1	1	------	------	------	------	------	------
12	4 N	22 W	Santa Maria Crude Oil	------	------	------	------	1	1	------	------
19	4 N	22 W	West American Oil Co.	------	------	1	1	1	1	------	------
			Totals	3	4	2	2	2	2	------	------

Following is a list of decisions rendered showing the nature of the development for the past year:

DECISIONS.

T. 4 N., R. 21 W., S. B. B. & M.

SECTION 8.

Great Republic Oil and Paint Co.

Well No. 2, drill, CC-269.

Approved proposal of the company to shut off water at a depth of about 200′.

SECTION 17.

Capitol Crude Oil Co.

Well No. 25, drill. CC-209.

Notice of intention to drill received from the company stated that there was no water to shut off. Recommended that the company notify this department for test of water shut-off if a string of casing was landed above oil-bearing formations.

Well No. 25, shut-off. C-171.

Test of water shut-off for the 11⅝″ landed at 233′ approved as satisfactory.

Capitol Crude Oil Co.

Well No. 24. Letter 3/27/17.

Notice of intention to drill this well was filed with the Board of Supervisors of Ventura County, instead of with the State Mining Bureau, and the well was not drilled under the supervision of this department.

T. 4 N., R. 22 W., S. B. B. & M.

SECTION 11.

Pan-American Petroleum Co.

Well No. 7, drill. CC-310.

Approval to commence drilling was delayed on account of well records for this property not having been proviously filed with this department. Information from well records was not complete nor sufficient to recommend actual depth of water shut-off. Recommended that oil-bearing formations from which adjoining wells produce, be protected from water.

SECTION 12.

Santa Maria Crude Oil Co.

Well No. 3, deepen. CC-294.

Approved proposal of the company to deepen this well and shut off water at a depth of 525′.

SECTION 19.

West American Oil Co.

Well No. 1, deepen. CC-121.

Approval given to deepen the well to possible oil sands. This was a prospect unfinished well.

Well No. 1, shut-off. C-144.

Test showed that large volume of surface water was shut off but some water and tar came into the well. Owing to the fact that this was a wildcat well, proposal of the company was approved to drill out bridge and test well by pumping for ninety days, and in case the oil sand was found commercially productive, a successful shut-off should be made above the oil sand.

VENTURA FIELD.

GENERAL DESCRIPTION.

The recently developed area situated near the city of Ventura and lying in the Ex-Mission, Cañada Larga and San Miguelito Ranchos, and certain government subdivisions lying to the west of Rancho San Miguelito and extending to the coast line, which area is included in Township 3 North, Ranges 23 and 24 West, S. B. B. & M., has been mapped by this department as the Ventura Field.

HISTORY OF DEVELOPMENTS.

Drilling was commenced by the Traders Oil Company on one of the first wells in this field in July, 1912. This well is located in Section 16, T. 3 N., R. 23 W., S. B. B. & M., on the west side of Ventura River Valley and about 2 miles north of the top of the Ventura anticline along which the more recent wells are drilling. This well has been drilled to a depth of 4140′ and, according to the log record, slight showings of oil were encountered at a depth of about 3400′, and the well is standing idle at the present time.

The first well was drilled on the Ventura anticline, on the east side of Ventura River Valley and on the west side of Rancho Ex-Mission, T. 3 N., R. 23 W., in the year 1914, by the State Consolidated Oil Co., and was abandoned after a depth of 1815′ had been reached. A slight showing of oil and gas was encountered at a depth of about 1600′. This well did not penetrate formations from which production was obtained at a later date from adjoining wells.

During the years 1914–1916, two wells were drilled by Joseph B. Dabney on the west side of Ventura River Valley, in Section 21, T. 3 N., R. 23 W. These wells reached a depth of about 500′ without penetrating oil-bearing formations and were abandoned in January, 1917.

The second well was commenced by the State Consolidated Oil Co. in March, 1915, and is now known as "Lloyd" No. 1. This well is located about 650′ south of the first well drilled by this company. Log records show that oil-bearing formations were penetrated in this well at depths of 2300′ and 2550′ respectively. The first oil-bearing horizon was shut off behind the 8¼″ casing. Water was probably shut off above the second showing of oil penetrated by this well and these formations were not tested for their productiveness on account of subsequent mechanical difficulties. Reference to list of official decisions given below gives a brief record of recent work done by the company.

Well No. 2 "Lloyd" of the State Consolidated Oil Co. commenced drilling in May, 1916. The well was drilled to a depth of 500′ with Standard tools and two joints of 15½″ screw casing and 500′ of 12½″ casing were landed. The 12½″ casing was subsequently removed from the well. The hole was drilled from 500′ to a depth of 2250′ with rotary tools. Various formations carrying gas and considerable quantities of water were encountered above this depth. A strong showing of oil was encountered at a depth of 2185′. When a depth of 2250′ had been reached in drilling, a heavy flow of water from the well undermined the foundation of the derrick, which fell over, carrying with it drill pipe which had previously been pulled out of the well. Some gas and aprpoximately 100 bbls. cf 56° Baumé gravity oil per day accompanied the flow of water. This well averaged about 12 bbls. of oil and 250 bbls. of water per day during the month of June, 1917. The flow of water, oil and gas from this well caused a crater to be formed at the mouth of the well. This crater was about 50′ in diameter and about 35′ deep. Two rotary pumps, a blowout preventor and some rotary tools were lost in this crater and have not been recovered from the well.

The necessity of repair work at this well to protect oil-bearing formations from water was called to the attention of the company on several occasions during the latter part of the year 1916, and the early part of the year 1917. A hearing was held at Ventura on October 26, 1917, and the following formal order issued:

ORDER NUMBER FOUR
BY
STATE OIL AND GAS SUPERVISOR R. P. McLAUGHLIN
DATED OCTOBER 31, 1917,
RELATIVE TO
STATE CONSOLIDATED OIL COMPANY, LLOYD WELL No. 2.
TRACT "R", RANCHO EX MISSION
IN VENTURA COUNTY.

"To *State Consolidated Oil Company,*
Mr. Ralph B. Lloyd:

It appearing to the supervisor that water in damaging quantities has access to productive oil sands in that certain well known as "Lloyd No. 2" of the State Consolidated Oil Company, situated on Tract "R", Rancho Ex-Mission, in the County of Ventura; and

It further appearing that said condition has existed for a long period of time, said supervisor has caused an investigation to be made, pursuant to Chapter 718, Statutes of 1915, amended 1917, and has determined that the following conditions exist:

The well was drilled to a depth of 500 feet with cable tools, 40 feet of 15½-inch screw casing was used as conductor from the bottom of the cellar, below the rig, and 500 feet of 12½-inch casing was placed in the well. About July, 1916, the 12½" casing was removed and rotary tools were used in drilling the well to a depth of 2250 feet, at which depth, in September, 1916, water and oil flowed from the well in such quantities that the ground around the well was washed away and the rig fell. There is at present no casing in the well.

The amount of water initially flowing from the well is reported to have been about 500 barrels per day, accompanied by about 100 barrels of oil per day. It appears that the State Consolidated Oil Company received certain payments of money as a bonus for having produced oil in said quantity. The amount of water now issuing from the well is said to be about seventy-five barrels per day, accompanied by about four barrels of oil per day. The market value of the oil at the well is about $2.25 per barrel.

It is reported by the State Consolidated Oil Company that about May 1, 1917, work was commenced for the purpose of filling the cavity about the well, erecting a rig, and placing casing in the well in such manner as to prevent water from entering the oil-bearing formations reported between a depth of 2185 feet and the bottom of the hole. The company further reports that since May 1, 1917, approximately two thousand dollars ($2000) has been expended for labor at the well.

On October 26, 1917, when the well was inspected by the supervisor, the cavity had been partly filled with earth, conductor pipe had been set over the well, pumps were carrying the flow of water and oil from within the conductor pipe, and forms were being constructed suitable for the building of concrete rig foundations.

There are some six other wells drilling in the immediate vicinity.

The geological conditions, together with the results of wells drilling in the neighborhood, indicate the probable existence of a considerable area of land likely to produce oil and gas in commercial quantities.

The interest of the people of the State of California, and persons owning property in the immediate vicinity, demands that work be actively and continuously carried on for the purpose of protecting said oil and gas deposits from damage by infiltrating water. The damaging condition having existed for more than a year, without evidence that reasonable progress has been made towards repair, it appears to the supervisor that a formal order should be issued for the purpose of insuring active and continuous repair work.

Now, therefore, pursuant to Sections 8 and 11, Chapter 718, Statutes of 1915, amended 1917, it is hereby ordered that:

First: Work of laying foundation and erection of drilling rig be continuously pursued in workmanlike manner.

Second: Screw casing not less than 15½ inches in diameter be placed in the well from the ground surface to a depth sufficient to insure a permanent and secure bond, by means of cement or otherwise, with the walls of the hole. Said casing to serve as a conductor and prevent fluid and gas from flowing from the well except through said casing. The depth and manner of securing said casing shall be determined to the satisfaction of the supervisor as conditions, encountered during progress of the work, may warrant.

Third: That in addition to the said conductor pipe, casing shall be placed in the well in such manner as to prevent water, encountered above a depth of 2185 feet, from passing to lower depths. The depth and manner of placing such casing shall be determined to the satisfaction of the supervisor as conditions, encountered during progress of the work, may warrant.

Fourth: After placing said conductor pipe and casing, such plugs as may be necessary shall be placed in the bottom of the well for the purpose of preventing any water encountered below oil or gas-bearing formations from entering same.

Deputy Supervisor M. J. Kirwan of Los Angeles is hereby authorized to represent the supervisor in so far as it may be necessary to inspect the work and receive proposals and reports concerning the same."

State Consolidated "Hartman" No. 1, Section 22, T. 3 N., R. 23 W.: This well is located about 900′ north of the State Consolidated Oil Co. "Lloyd" No. 2, and along the west line of Section 22. Drilling was commenced at this well on October 14, 1916. Upon receipt of notice of intention to commence drilling, recommendations were made by this department to shut off water at a depth of about 2200′. Study of peg model and cross sections prepared by this department subsequent to the issuance of this decision indicates that formations which are productive in "Lloyd" wells Nos. 1 and 2, and Shell Company "Hartman" No. 1, should have been encountered in this well at a depth of about 2200′. The log shows that this well has been drilled to a depth of 4000′ and that oil-bearing formations have not been encountered. A string of 10″ casing was cemented at a depth of 2583′ and failed to shut off water. This well was drilled with standard tools and kept full of thick mud to prevent gas blow outs. No attempt was made to test formations encountered between depths 2200′ and 2583′, in order to determine the nature of their contents.

Shell Co. of California "Hartman" No. 1, Section 22, T. 3 N., R. 23 W. This well is located about 600′ northeast from State Consolidated "Lloyd" No. 2. Drilling was commenced at this well January 27, 1917. The 12½″ casing was cemented at a depth of 1984′, in order to shut off water encountered above this depth. Ten inch casing was cemented in this well at a depth of 2193′. Test of water shut off was witnessed and approved by this department. The well was drilled to a depth of 2215′. Reference to the list of official decisions below gives a brief record and results of tests made at this well.

General Petroleum Corporation "Barnard" No. 1, Section 22, T. 3 N., R. 23 W., commenced drilling March 7, 1917. This well was drilled to a depth of 1980′ and 12½″ casing was cemented at a depth of 1976′. The well was shut down after cementing this casing, pending further developments in this area. Log records shows that oil or gas-bearing formations were not encountered in this well.

A conference was called by the State Oil and Gas Supervisor and held in the Los Angeles office of this department on June 13, 1917, to consider steps which should be taken towards necessary repair of certain wells drilled on the property of the State Consolidated Oil Co. This conference was attended by Mr. E. J. Miley of the State Consolidated Oil Co., Mr. Felix Chappellet of the General Petroleum Corporation, and Mr. Ralph B. Lloyd, representing certain land owners. Following this conference, written recommendations were made covering the details of work necessary for the repair of each well in the affected area.

Drilling operations were commenced by the Shell Co. of California at "Gosnell" well No. 1, on February 7, 1917, and at "Taylor" No. 1 on August 11, 1917, both wells located in Section 21, T. 3 N., R. 23 W., and at "McGonigle" No. 1, Section 23, T. 3 N., R. 23 W., on March 19, 1917. These wells are located near the top of the Ventura anticline. Considerable quantities of gas have been encountered in these wells; but oil in commercial quantities has not been developed up to the present time.

Reference to the following summary of notices and decisions shows that the General Petroleum Corporation is drilling two wells in Sections 17 and 22, respectively, of T. 3 N., R. 24 W.

Section	Township	Range	Company	New wells		Test of water shut off		Deepen or redrill		Abandon	
				Notices	Decisions	Notices	Decisions	Notices	Decisions	Notices	Decisions
21	3 N	23 W	Shell (Taylor)	1	1	1	1	------	------	------	------
21	3 N	23 W	Shell (Gosnell)	1	1	------	------	------	------	------	------
21	3 N	23 W	J. B. Dabney	------	------	------	------	------	------	2	2
22	3 N	23 W	Shell (Hartman)	1	1	1	1	1	2	------	------
22	3 N	23 W	Gen. Petroleum	1	1	------	------	------	------	------	------
22	3 N	23 W	State Consol.	1	1	------	1	------	1	------	------
23	3 N	23 W	Shell (McGonigle)	1	1	------	------	------	------	------	------
9	3 N	24 W	Kellerman & Vigus	1	1	------	------	------	------	------	------
17	3 N	24 W	Gen. Petroleum (Hobson 2)	1	1	------	------	------	------	------	------
21	3 N	24 W	Gen. Petroleum (Hobson 1)	1	1	------	------	------	------	------	------
			Totals	9	9	2	3	1	3	2	2

Following is a list of decisions rendered, covering operations at wells in this field for the past year, accompanied by a statement showing character of work done at each well and recommendations made by this department.

DECISIONS.

T. 3 N., R. 23 W., S. B. B. & M.

SECTION 21.

Rancho Cañada de San Miguelito.

Joseph B. Dabney.

Well No. 2, abandon. CC-185.

Approved abandonment, as the well was shallow and no oil or gas sands had been encountered, no plugging was required.

Well No. 1, abandon. CC-186.

Approval given to pull 12½″ casing. No plugging necessary, as the well did not penetrate oil-bearing formations.

Shell Co. of California.

"Taylor" Well No. 1, shut off water. C-204.

Data at hand indicates that the 12½″ casing cemented at about 2077′ did not shut off water. This report approved proposal of the company to cement 10″ casing at a depth of about 2624′.

"Taylor" Well No. 1, commence drilling. CC-123.

Proposal of the company to shut off water at a depth of about 2500′ was approved.

"Gosnell" Well No. 1, commence drilling. CC-247.

Approved proposal of the company to shut off water at a depth of about 2145′.

SECTION 22.

General Petroleum Corporation.

"Barnard" Well No. 1, commence drilling. CC-194.

Estimated water shut-off at a depth of about 2100′ and recommended that all casing landed above oil sand should be cemented.

Rancho Ex-Mission, Tract "R".

State Consolidated Oil Co.

"Lloyd" No. 1, shut-off. C-143.

Test indicated that water from above a depth of 2542′ was probably not passing to lower levels in the well. Proposal of the company, to deepen the well only through the sand encountered at time of test and pump the well, was approved.

"Lloyd" Well No. 1, redrill. CC-311.

Subsequent to report shown above the 6¼″ casing was found to be collapsed at the bottom of the well and in attempting to remove this casing the well was shot 17 times between depths of 2542′ and 1900′; portions of the 6¼″, 8¼″ and 10″ casings were removed above 1900′, and about 700′ of 6¼″, 8¼″ and 10″ casings frozen together fell back into the well as it was being removed, necessitating drilling up of this casing or sidetracking it in order to again reach the shut-off point. When the well was in this condition, the company filed a proposal to sidetrack all casing in the well below a depth of 1090′ and re-cement with 10″ casing at a depth of about 2200′. This department recommended that the company shut off water at a depth of about 2260′ in order to test oil-bearing formations formerly shut off.

Well No. 1, Hartman, drill. CC-179.

Notice from the company to drill this well states that they expected to shut off water at a depth of about 2170′. Recommended that each string which was landed should be cemented and that if water reported in well No. 2 "Lloyd" at 1800′ was the last water encountered, a shut-off should be made at a depth of about 2200′. The company failed to carry out this recommendation and it may be necessary to conduct certain tests to determine whether or not oil-bearing formations have been shut off when 10″ casing was cemented at a depth of 2583′.

Shell Co. of California.

Well No. 1, Hartman, drill. CC-208.

Approved proposal of the company to cement 12½″ casing at a depth of about 2230′.

Well No. 1, Hartman, deepen. CC-315.

Approval of proposal to deepen withheld until test of water shut-off was witnessed by this department.

Well No. 1, Hartman, shut-off. C-174.

Approved test of water shut-off with 10″ casing cemented at a depth of 2195′ and also approved proposal to deepen about 20′. (See decision No. CC-315.)

Well No. 1, Hartman, deepen. CC-298.

Approved company's proposal to deepen about 35′ to encounter second oil sand.

SECTION 23.

Shell Co. of California.

Well No. 1, "McGonigle," drill. CC-249.

Approved proposal of the company to shut off water at a depth of about 2870′.

T. 3 N., R. 24 W., S. B. B. & M.

SECTION 9.

Kellerman and Vignus.

Well No. 1, drill. CC-171.

Approved proposal of the company to drill this well, cementing each string of casing which was landed before reaching oil sands.

SECTION 17.

General Petroleum Corporation.

Well No. 2, commence drilling. CC-177.

Recommended that, as this was wildcat territory, each string of casing which was landed should be cemented and tested.

SECTION 22.

General Petroleum Co.

Well No. 1, drill. CC-176.

Recommended that the company cement and test each string of casing landed.

MISCELLANEOUS FIELDS.

Notice of intention to deepen well No. 1 of the True Oil Company, Section 2, T. 9 N., R. 24 W., was received by this department. This well is located in the northwest corner of Ventura County at the head of the Cuyama Valley. The work of deepening this has been recently commenced.

The following official decision was made relative to the work of deepening this well:

DECISION.

T. 9 N., R. 24 W., S. B. B. & M.

SECTION 2.

True Oil Co.

Well No. 1, deepen. CC-301.

The proposal of the company to deepen the well below a depth of 1772′ (original) depth) was approved.

CHAPTER III.

SANTA BARBARA AND SAN LUIS OBISPO, MONTEREY, AND SANTA CLARA COUNTIES.

By R. E. COLLOM, Deputy Supervisor.

The work of this department, in the district covered by the Santa Maria office, has taken the deputy, during the past year, into the Sargent field, near Gilroy; prospect operations on the San Juan River, south of Shandon; the Bradley field; the Arroyo Grande field, and the various fields in the Santa Maria district. These operations are all included in the district, designated for this office, as covering Santa Barbara County and all territory north to San Francisco and west of the summits of the Temlor and Mt. Diablo ranges. The bulk of the work in the Santa Maria office has been done in connection with the fields in the Santa Maria district in Santa Barbara County.

During the year just passed, almost all large operating companies in the State of California, as well as producers from Oklahoma, Texas, and other oil producing states, have turned, with interest, to the potential possibilities of the Santa Maria district. In numerous instances this office has been able to serve geologists and engineers of inquiring companies with time saving information relativve to the geology and other natural features of the district. One of the principal results of this interest among outside operators was the development of the Casmalia field, which now includes 3000 acres of proved oil land.

The two general causes for this activity were the ever-growing increase in consumption over production and the attitude of the Federal Government in the oil litigation in the San Joaquin Valley fields. This latter cause undoubtedly forced certain producers into low gravity territory which otherwise might have remained undrilled for some time to come.

There are still large acreages of undeveloped territory in the Santa Maria district. The experience in present Casmalia field development has shown that operators for many years had drilled wells around the edges of the productive area without encouraging results; and, in the examination of likely looking anticlines in the Lompoc, Cat Canyon and other areas, the engineer should hold this bit of Casmalia field history in mind.

It is true that numerous abandoned or idle wells, standing in the outskirts of present productive territory, have seemed to define the limits for drilling. It will be recalled, however, that in many cases these "strippers" were drilled by stock companies, punching holes quickly, and eager to get a showing. Numerous "stripper" wells, shown on the map as abandoned, are only a few hundred feet deep. An inquiry addressed to any of the Santa Maria district operators will bring ample testimony to the fact that there are good producing wells in this field which did not show a trace of oil, even with a chloroform test, at the time of completion. It was only after the head of drilling water was pumped off the formations that oil began to show. So, with these past experiences and present improved drilling methods, it is probable that areas yet remain in the Santa Maria district to give a repetition of the history of the recently developed Casmalia field.

With few exceptions it may be said that the relations of this department and the operators in the district, with respect to the work of the department, have been upon a co-operative basis. Acknowledgment is made to the operators who, through this co-operative attitude, have made the carrying out of the work and instructions of this department a pleasure.

The deputy was assisted in the preparation of this report by an inspector, and a stenographer, both of whom have come into the office since the close of the fiscal year.

DESCRIPTION OF FIELDS IN DISTRICT No. 3.

Santa Maria District.

The Santa Maria District comprises the Casmalia, the Cat Canyon, the Lompoc, the Los Alamos and the Santa Maria fields.

The Casmalia field is bounded on the west by the Pacific Ocean, on the south by the San Antonio Valley to Harris Station, thence northerly by the California State Highway to Santa Maria. The northerly portions of this area lie in the Santa Maria Valley.

The Santa Maria field is bounded on the west by the California State Highway from Santa Maria to Harris Station, thence easterly to Careaga, and thence by a line running due north along the east line of the Newlove estate of the Union Oil Co. and intersecting with Santa Maria River.

The Cat Canyon field is bounded on the west by a line running due north from Careaga, on the California State Highway along the east line of the Newlove estate of the Union Oil Co. and intersecting with the Santa Maria River. It is bounded on the south by the California State Highway to point of intersection with the west line of La Laguna Rancho, thence northerly along the west lines of La Laguna Rancho and Tinaquaic Rancho, and includes prospect wells in the Tepusquet and La Brea Creek regions.

The Los Alamos field is bounded on the west by the eastern boundary lines of the Cat Canyon field, on the south by the California State

Highway to Los Olivos. The eastern and northern boundaries are determined by the foothills of the San Rafael mountains.

The Lompoc field is bounded on the west, from the mouth of San Antonio Creek to the mouth of the Santa Ynez River, by the Pacific Ocean, on the south by the Santa Ynez River to Santa Ynez Mission, thence northerly to Los Olivos, thence westerly to Zaca, on the California State Highway, and by the California State Highway to Harris; thence along San Antonio Creek to the ocean.

Arroyo Grande District.

The Arroyo Grande field comprises all proved and prospective territory between and adjacent to Arroyo Grande, Pismo and Edna, all in San Luis Obispo County.

Other fields.

There has not been sufficient work done in other fields in District No. 3 to warrant defining their limits at this time.

The number of wells in this district and the number of logs on file is shown by the following tabulation. Graphic logs are being drawn as fast as possible. The number already completed is also shown in the tabulation:

Summary of Well Records of District No. 3.

Field	Wells listed	Logs filed	Graphic logs	Wells accounted for by production reports	Number of wells for which production reports have been regularly posted
Casmalia	83	23	0	28	17
Cat Canyon	104	60	29	24	13
Santa Maria	284	246	197	222	83
Lompoc	57	44	19	28	5
Los Alamos	9	4	1	1	1
Arroyo Grande	18	2	0	3	0
Huasna	2	0	0	0	0
Carrisa	1	0	0	0	0
San Juan	1	0	0	0	0
Bradley	6	2	0	0	0
Sargent	13	12	0	7	0
Summerland	138	0	0	0	0
	716	393	246	313	119

Peg models covering above 2250 acres, or 21% of the proved land in the district, have been constructed.

The following table shows the totals of notices received and decisions rendered on proposed oil well operations in the various fields during the past year in District No. 3:

	New wells	Test of shut-off	Deepen	Redrill	Abandon	Total
Santa Maria Field—						
Notices	7	15	12	2	3	39
Decisions	*	10	11	2	2	25
Cat Canyon Field—						
Notices	25	35	2	7	12	81
Decisions	*	32	2	7	10	51
Casmalia Field—						
Notices	54	48	----------	9	----------	111
Decisions	*9	37	1	9	----------	56
Lompoc Field—						
Notices	----------	----------	1	1	7	9
Decisions	*	----------	1	1	7	9
Arroyo Grande Field—						
Notices	5	5	1	1	----------	12
Decisions	*	5	2	----------	----------	7
Sargent Field—						
Notices	5	4	----------	----------	1	10
Decisions	*	4	1	----------	2	7
Miscellaneous—						
Notices	2	2	3	----------	----------	7
Decisions	*	----------	2	----------	----------	2

*In most instances decisions on notices of intention to drill new well were made on Form 113 and therefore are not included in totals, which cover only reports on Forms 109 and 111.

CAT CANYON FIELD.

In the Cat Canyon Field the following companies have been engaged in development operations during the past year:

Associated Oil Co.—Well No. 4, Sec. 31, T. 9 N., R. 32 W.

J. W. Goodwin—Well No. 1, Sec. 31, T. 9 N., R. 32 W.

Palmer Union Oil Co.—Wells Nos. 2 and 3, Sec. 30, T. 9 N., R. 32 W.

Pan-American Petroleum Investment Corporation—Wells Nos. 1, 2, 3, 4, Temporary Nos. 6A, 7A, 8A, 13A, 14A, 15A. All in Teresa Bell Tract, T. 8 N., R. 32 W., S. B. B. & M.

Pinal Dome Oil Co.—Wells Nos. 8 and 9, Sec. 26, T. 9 N., R. 33 W.

Santa Maria Oilfields, Inc.—Well No. 8, Sec. 23, T. 9 N., R. 33 W.; Well No. 1 Bell, Well No. 2 Bell, Sec. 22, T. 9 N., R. 33 W.

Standard Oil Co.—Shaw Ranch No. 3, T. 8 N., R. 32 W., S. B. B. & M.

West States Petroleum Co.—Henderson well No. 2, Sec. 30, T. 9 N., R. 32 W.

Details relative to above work may be found under record of "Notices Received and Decisions."

Water conditions.

The development operations in the Cat Canyon field during the period covered by this report have brought some unexpected and, in several cases, unusual water features. These new water conditions have been a hindrance to the rapid development desired in certain quarters. In selection of sites for drilling wells on the Palmer Union Stendell property and some of the later wells of the Pan-American Petroleum Investment Corporation on the Bell tract, it is notable that a more systematic study by means of cross sections made from the logs of wells already drilled, would have brought conclusions radically different as regards probable depth of oil formations.

With a little less certainty it is true that the unusual water features, in a measure, could have been anticipated. It is now an established fact among Cat Canyon operators that no dependence can be placed upon the attitude of the Quarternary terrace deposits as indicating the position of anticlines in the oil formations. Reasons for this may be found under the subject of "Cat Canyon Oil Formations" in this report.

The following table gives comparative figures for water and oil produced for June, 1916, and June, 1917:

	June, 1916	June, 1917	Increase
Total fluid	59,644	74,269	14,625
Water	2,357	3,337	980
Oil	57,287	70,932	13,645
Number of wells producing	18	24	6

The foregoing shows that this Cat Canyon production is unusually clean, averaging about 4.5% water.

SANTA MARIA FIELD.

Water conditions.

Water conditions in the Santa Maria field have remained practically unchanged during the past year. The following table gives comparative figures on water and oil produced in June, 1916, and June, 1917:

	June, 1916	June, 1917	Increase
Total fluid	335,526	461,929	126,403
Water	107,131	160,205	53,074
Oil	228,395	301,724	73,329
Number of wells	185	196	11

Although it will be noted that there has been an increase in the total fluid produced, there has been a greater proportionate increase in the amount of water produced. This is in face of the fact that increase in oil is due principally to the Union Oil Co. work of deepening into the 3d oil zone on the Newlove lease.

These deepening operations represent the only work of importance that has been proposed during the year. The work has been carried out under the direct supervision of this department.

Remedial work.

There have been no proposals made for remedial work in the Santa Maria field during the past year. Although the deepening operations, already mentioned, on the Newlove lease of the Union Oil Co., have been semi-remedial in character, the principal objective was the increased production to be gotten from the 3d oil zone. The advantage that the Union Oil Co. has gained in deepening wells to the 3d oil zone is instantly apparent to anyone who has followed Santa Maria field developments.

The Western Union Oil Co. stated to this department, by letter, on April 7, 1917, that arrangements had been made with the Union Oil Co. whereby this department should be requested to make an analysis of water conditions in the area called "Group B"[1] and outline necessary remedial work. This desire on the part of the companies concerned seems to have lacked the vitality necessary to carry it to the point of a written understanding. However, the deputy prepared necessary productiongraphs, cross sections, and other data on "Group B". It was found that the conditions in "Group B" are similar in many ways to those in other 2d zone areas in the Santa Maria field.

Recommendations.

On the Newlove, Hartnell, Squires, Escolle, Graciosa and a portion of the Careaga areas in the Santa Maria field, the 2d oil zone yields more water than oil. It is possible in some instances that wells drilled on intermediate locations into the 2d oil zone would produce, for a time, with a low water content; in fact, it is with this possibility in view that an effort is being made to seal 2d zone formations behind a string of casing wherever wells are being deepened. This sealing operation should have had the effect, if properly conducted, of preventing water, which usually occurs near the bottom of the 2d oil zone, from moving into the upper part of the 2d oil zone.

Where wells have been drilled completely through the 2d zone formations, it has been demonstrated in a number of cases that cement plugs—50 to 200 ft. in depth—placed in the bottom of these wells, have shut off the 2d zone water. The Western Union Oil Co. in several cases has remedied 2d zone wells by first plugging in bottom, and then perforating for 1st zone oil. The amount of oil gotten from the 1st oil zone usually compensates for the amount shut off in plugging. A study of the production data of one group of wells, some of which were plugged in bottom to shut off 2d zone water, shows that there may be cases where plugs are no longer effective, and tests should be made to determine if they are still in place.

The boundaries of the productive area of the Santa Maria Field are now practically defined. The productive life of the field depends entirely upon remedies to be applied to conditions as they now exist.

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[1] First Annual Bulletin 73, C. S. M. B., page 200.

Although an operator may claim that he is raising all the water above ground that a well lets into the formation, the cost of handling this water is a factor not to be overlooked. When the water comes to the surface in the form of emulsion, the oil associated with it must be treated with steam or electric dehydrators. Emulsified oil must be held in storage awaiting treatment; this crowds storage facilities. Also, each time the oil is moved from one container to another, it is subjected to evaporation losses. Thus the presence of water adds additional cost and losses to the handling of the oil.

With the probable confirmation of reports to the effect that the Pinal Dome Oil Co.'s holdings have been purchased by the Union Oil Co. of California, the responsibility for the future of the Santa Maria Field evidently rests to a great extent with the latter company.

CASMALIA FIELD.

At the close of the year covered by the previous Annual Report, the companies operating in the Casmalia Field were the Casmalia Syndicate, with three wells on the Punta de Laguna Rancho; the Pinal Dome Oil Co., with two wells on the Escolle Tract, the Standard Oil Co., drilling two prospect wells on the westerly end of the Schuman Anticline.

At that time the Casmalia Syndicate No. 4 well was capable of producing 400 bbls. per day of 10 gravity oil. The well, however, was idle for lack of market.

At the end of June, 1917, the following companies are operating in the Casmalia Field:

Associated Oil Co.—Casmalia Syndicate, Ord Peshine property.
Dohney-Pacific Petroleum Co.—Soladino property, Lease No. 1, Lease No. 2.
Pinal Dome Oil Co.—Elizalde lease, Escolle lease, Quintero lease.
Shell Co. of California.—Todos Santos Rancho.
Standard Oil Co.—Pezzoni lease, Tognozzini lease.
Wilkes Bros. Inc.—Stokes lease.

Fifty-four applications to drill new wells were filed with this department during the year ending June 30, 1917.

Water conditions.

The following table gives comparative figures on water and oil produced for June, 1916, and June, 1917:

	June, 1916	June, 1917	Increase
Total fluid	2,000	67,446	65,446
Water	None	5.937	5.937
Oil	2,000 est.	61,509	59,509
Number of wells	1	13	12

When No. 4 well was drilled on the Arrellanes lease of the Casmalia Syndicate in 1916, top-water was entered at a depth of 135 feet. No other water stratum was found in drilling to prevent depth. The water problem in the Casmalia Field, at that time, seemed to be a simple one.

After development started on a large scale in September, 1916, the water situation in the Casmalia Field was found to be a difficult one for the following reasons:

1. There are several top water strata.

2. Certain portions of the brown shale takes up large quantities of drilling water.

3. From the top of the ground to the bottom of finished wells the formations are all shale. "Shells" occur at inconsistent intervals in various wells. Correlation of oil-bearing formations is therefore difficult.

4. Finished wells, producing clean oil at the rate of 400 to 1000 bbls. per day, would suddenly start producing water. The temperature of the water was as high as 142 degrees Fahrenheit.

When these conditions became known the operators realized the importance of establishing depths for stratigraphically uniform water shut-off. The Casmalia Field operators held a conference in the Mining Bureau office with the deputy and agreed to cooperate in every way possible to study and control the situation. Weekly drilling reports are furnished this department by the Casmalia Field operators for the purpose of keeping the field peg-model and well cross-sections up to date. Samples of water from every available definite source are being taken and analyzed. There is an organized determination to get at a solution of the difficulty.

In the Soladino-Arrellanes area a shut-off is made at depths of 700 to 900 ft. in order to exclude all top water strata.

The wells are then drilled through a heavy cold-tar zone. Very little drilling water is now used in these operations. Unless caving shale is encountered it has been found that the hole can be drilled practically "dry."

A second shut-off is made at a depth of 1200 to 1400 feet. This shut-off excludes the cold unproductive tar measure from the underlying hot-oil measures. The wells are then drilled into production at depths of 1500 to 1700 feet. It is a fortunate combination of circumstances that the oil, although heavy, is 130 deg. to 145 deg. F. in temperature and is therefore readily pumped.

The most difficult problem has been to account for the water suddenly appearing in clean producers.

A number of experiments involving bridging and plugging operations have led the operators to believe that the first wells were drilled too deep. Some of these wells were drilled in shale to a depth of 1900 ft. or more. Several of these wells that have been bridged or plugged to a depth of say 1650 feet have shown marked improvement as to water.

Another indication that the water is coming from considerable depth is its high temperature. Also, wells recently drilled to shallower depths have not yet shown any quantity of water.

The following are the results of analyses of a number of samples of this supposed lower water:

TABLE A.

Well number	Total solids	Sodium carbonate	Sodium chloride	Sodium sulphate	Magnesium carbonate	Magnesium chloride	Calcium carbonate
Doheny Pac. Soladino, No. 3	254.40	82.10	136.86	1.53	3.91	None	2.23
Doheny Pac. Soladino, No. 4	220.00	76.00	141.00	2.10	--------	--------	*
Associated Oil Co. Arrellanes, No. 91	211.48	54.09	131.56	3.56	4.14	None	4.25
Doheny Pac. Lease 2, No. 1	794.83	96.83	635.80	5.11	4.10	None	1.75
Pinal Dome Oil Co., Escolle No. 2	528.96	65.24	412.95	None	2.84	None	2.57
Doheny Pac. Lease 2, No. 5	814.82	137.15	630.95	None	5.67	None	2.34
Associated Oil Co. Peshine, No. 21	361.80	70.59	241.86	None	4.13	None	4.36
Doheny Pac. Lease 1, No. 7	435.85	106.52	291.55	.54	3.77	None	3.08
Doheny Pac. Lease 1, No. 10	586.26	255.46	173.62	1.07	8.80	None	3.03

*Analysis incomplete.

TABLE B.

Well number	Total solids	Sodium carbonate	Sodium chloride	Sodium sulphate	Magnesium carbonate	Magnesium chloride	Calcium carbonate
Doheny Pac. Soladino No. 38	154.01	2.97	49.16	None	6.46	27.07	24.67

A comparison of the foregoing analyses, Table A, with the analyses of an "upper water"—that is, a water taken from above the oil measures, at a depth of 280 ft., in Doheny Pacific well, Soladino No. 38, Table B—shows a marked difference in the proportions of the various salts. It will be noted that the analyses in Table A run high in Sodium Carbonate and Chloride compared to the same salts in Table B, and that Magnesium Chloride is absent and Calcium Carbonate low, in Table A, but present in large proportions in Table B.

Geology of the Casmalia field.

The present developed portion of the Casmalia field lies along the crest and south flank of the Schuman anticline 1½ miles northeast of the town of Casmalia. From the west line of the Doheny Pacific property the anticline appears to be plunging toward the southeast at the rate of about ten feet to one hundred. The north flank of the

Schuman anticline is steep, dipping, and does not appear to be favorable for drilling.

The formation entered in drilling is Monterey shale. It is probable that the productive zone, judging from the hard, flinty nature of the shales, is the equivalent of the 2d oil zone in the Santa Maria field. A log of an old well, drilled to a depth of 2485 feet, indicates that the Vaqueros sand, 3d oil zone in Santa Maria field, should be entered at a depth of 600 to 800 ft. below the top of the present productive zone in the Soladino-Arrellanes group. The tar zone, above the productive zone in this group, seems to correlate with productive formations in wells farther to the southeast.

The oil.

The gravity of the oil varies from 9 deg. Baumé to 17 deg. Baumé. The oil is quite viscous. It is necessary to heat the heavy oil and mix it with distillate for transportation. An effort is being made in an experimental way to raise the gravity and decrease the viscosity by a cracking treatment.

The heaviest oil comes from wells at the westerly end of the anticline in the Soladino-Arrellanes area. Going southeasterly, along the plunge of the anticline, the oil becomes lighter. This change in gravity is probably due to the fact that the lighter fractions of oil in the formations near the apex of the anticline have had an opportunity to escape through fractures and crevices.

The unusually high temperature of some of the oil has already been mentioned in the discussion of water conditions.

LOMPOC FIELD.

Water conditions.

There has been no change in operating conditions in the Lompoc field during the past year. The following table gives comparative figures on water and oil produced for June, 1916, and June, 1917:

	June, 1916	June, 1917	Decrease
Total fluid	85,526	81,079	4,447
Water	38,827	37,836	991
Oil	46,699	43,243	3,456
Number of wells	26	27	------------

The Pacific Oilfields Ltd., completed the work of abandoning 6 wells on its property, Sections 28 and 33, T. 8 N., R. 34 W., S. B. B. & M., since the last report.

The Union Oil Co. of Cal., the Orcutt Oil Co., and the West Coast Oil Co. are the only companies operating in the Lompoc field at this time.

ARROYO GRANDE FIELD.

In the Arroyo Grande field 3 prospect wells are being drilled.

In the proved area the East Puente Annex Oil Co. drilled one well on the property of the Tiber Pacific Oil Co. The D. J. Oil Co. has drilled one well on the Muchado tract, and one well on the old Pacific Oilfields property. The D. J. Oil Co. is also engaged in redrilling operations on the old McNee property. These redrilling operations give promise of satisfactory results as the water is being shut off in old wells (see Report No. B-62), which were formerly good producers.

The following table gives comparative figures on water and oil produced for June, 1916, and June, 1917:

	June, 1916	June, 1917	Decrease
Total fluid	2,806	2,553	253
Water	96	75	21
Oil	2,710	2,478	232
Number of wells	4	4	

Oil formations.

In the Arroyo Grande field, near Edna, the oil is stored in the Pismo formation which overlies the Monterey. The Pismo beds appear to lie in gently dipping attitudes over the upturned and eroded edges of Monterey strata. It is probable that the oil now being produced, migrated from Monterey strata into its present reservoir. There are extensive outcrops of asphaltic rock along the northern border of the Arroyo Grande field.

The following log of a well, drilled in the north end of the field, shows that there are no extensive shale strata present in the Pismo formation, in this area, to act as a seal for the oil reservoir. The oil, therefore, made its own seal, in the form of asphaltic rock during the process of accumulation.

Log or well in Arroyo Grande field:

Formations Penetrated by Well.

Name of formation	Depth to top of formation	Depth to bottom of formation	Thickness
Adobe		35	35
Sand, showing water	35	100	65
Clay	100	125	25
Sand, carrying sulphur water	125	200	75
*Tar sand	200	690	490
Oil sand	690	712	122

*It is a portion of the "tar sand" logged between depths of 200 and 690 feet that outcrops on the northern boundary in the form of asphaltic rock.

BRADLEY FIELD.

The Bradley field lies 6 miles southwest of the town of Bradley, in Monterey County.

There have been eight wells drilled in this field. In April, 1917, the Asociated Oil Co. took over the old King well, of the Bradley Oil Co., in Section 36, T. 24 S., R. 10 E., M. D. B. & M. It is the intention to prospect for oil at Santa Margarita, Monterey contact.

Data on the geology and wells of the Bradley field are given by R. P. McLaughlin[1] in Bulletin 69.

SARGENT FIELD.

The producing wells in the Sargent field are situated on the La Brea Creek, in the Sargent Ranch, on Section 31, T 11 S., R 4 E., M. D. B. & M.

One operating company controls the present proved area in this field. The Gilroy Oil Co. has been operating this property during the past year under lease from the Watsonville Oil Co.

The wells here are small producers. They vary in depth from 900 to 1600 feet. The gravity of the oil averages 17 deg. Baumé, and production reports show the fluid to be exceptionally low in water content. The logs of two wells show salt water below productive oil sands.

The following table gives comparative figures for water and oil produced during June, 1916, and June, 1917:

	June, 1916	June, 1917	Increase	Decrease
Total fluid	2,043	1,770		273
Water	3	120	117	
Oil	2,040	1,650		390
Number of wells	5	6	1	

Oil formations.

The oil-bearing formations in the Sargent field are closely associated with the Monterey. The productive wells have been drilled on the La Brea anticline. The beds are steep dipping. (There are extensive oil seepages along the north side of La Brea Canyon.) Structural features undoubtedly limit the possible productive area to a narrow belt running parallel to the axis of the anticline.

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[1] McLaughlin, R. P., Petroleum Industry of California, Bull. 69, Cal. State Mining Bureau, 1914.

HUASNA FIELD.

The Huasna District lies directly north of the Santa Maria District in San Luis Obispo County.

Briefly the district is noted for numerous oil and tar seepages, and sulphur springs.

There is little of the younger Monterey present in the Huasna District. Sharp folding is the general rule. The oil seepages come, in many places, from fractures in upturned Monterey.

In the vicinity of the Huasna River the Monterey, or possibly the Vaqueros, is covered by Pismo formation. Petroleum of the Arroyo Grande field is found in the Pismo formation.

It is possible that an anticline in the Pismo formation in the Huasna District may form a reservoir for petroleum, providing the conditions of folding and erosion of underlying Monterey are favorable for the release into the Pismo of any petroleum present in the Monterey.

SUMMERLAND FIELD.

In the Summerland field there is very little change in the operating conditions, as well as the companies operating, from those covered by R. P. McLaughlin on pages 416-17 in Bulletin 69, Petroleum Industry of California, California State Mining Bureau, 1914.

The geology of this field is also briefly described in the above mentioned report.

GEOLOGY OF CAT CANYON OIL FORMATIONS.

Purpose of study.

In the First Annual Report[1] it was stated, with reference to Cat Canyon oil formations, that ''The importance of identifying these formations rests with the proposition that if they are in the Fernando, the prospector would be assured a greater anticlinal continuity than has been evinced in the occurrence of petroleum in the Monterey domes of the district.''

It was with the desire of throwing some light on this problem that the writer spent a great deal of his time during the past year in examining the geology of the Cat Canyon area, and other parts of the Santa Maria District.

There is not now enough definite stratigraphic or palæontologic evidence[2] to identify the Cat Canyon oil horizons conclusively with any one of the oil-bearing formations of the district. Data showing possible relations to Vaqueros, Monterey or Fernando are therefore given for the consideration of those interested.

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[1] First Annual Report, Bull. 73, Cal. State Min. Bur.

[2] A fairly good specimen of *Phacoides annulatus Reeve* was taken from a depth of 3110 ft. in Stendell No. 3 Well of the Palmer Union. This species ranges from Monterey to living.

Vaqueros.

There is no direct evidence to support a supposition that the oil originates in the Vaqueros formation. On page 209 of the First Annual Report it was stated that in order to identify Cat Canyon producing sands with the Vaqueros it would be necessary to merge the "big blue" and "big brown" of the Santa Maria field rather indefinitely into the blue shale of the Cat Canyon field, overlying the producing sand. Such a correlation would satisfy general lithological requirements as to sand and shale.

Bailer samples from wells drilled on Sections 30 and 31, T. 9 N., Range 32 W., S. B. B. & M., show that the flinty-shale equivalent of the 2d oil zone of the Santa Maria and Casmalia fields (Monterey) underlies the Cat Canyon producing sand in a thickness of at least 600 ft., showing oil ond gas. This in itself would seem to eliminate the Vaqueros possibilities, remembering that the 3d zone production in the Santa Maria field comes from Vaqueros sand, beneath these flinty shales, and close to Vaqueros-Monterey contact.

Monterey.

Before the Cat Canyon field was developed, it was generally supposed that should any petroleum be found, it would be in the Monterey formation. Published geological cross sections[3] show the anticlines traversing the Cat Canyon area to be folds of Monterey formation, with thin coverings of Fernando or Terrace deposits. Development of the area showed that Cat Canyon production is coming from sand strata, whereas the Santa Maria field production, excepting the 3d zone, Vaqueros, was taken from shale strata.

The nature of sand reservoirs and the gravity of the oil seem to be the principal features which have caused a number of early engineers and geologists to claim that the Cat Canyon production is from the Fernando formation. There is little surface evidence to support such a theory.

On the contrary, considering the Monterey series in the time sense,[4] and not as an unbroken lithological unit of shale, it is quite possible for the sand members to be present in the Monterey and, from present data on the subject, it is the writer's belief that such is the case in the Cat Canyon field.

Monterey outcrops in Cat Canyon area.

In the Cat Canyon field the Monterey, with one exception, does not appear at outcrop. In the exception referred to, the Monterey shale outcrops on the lower portion of the northern slope of the Holland grade, Section 33, T. 9 N., Range 32 W., S. B. B. & M., and can be traced by outcrops in an easterly direction to the exposed Monterey area in Foxen Canyon.

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[3] U. S. G. S. Bull. 322, Plate 7.

[4] The Monterey series in California-Louderback, Bull. Dept. Geol. U. C., Vol. 7, No. 10, pages 171-241.

Fernando outcrops in Cat Canyon area.

Because of the scarcity of Monterey outcrops in the Cat Canyon area, a careful study was made of the surface geology. Several Fernando sections, in other parts of the district, were studied in order to determine, if possible, the age of Fernando beds, exposed in the Cat Canyon, and the probable depths of Monterey contact. A collection of Fernando fauna was gathered by the writer from 17 localities in the Santa Maria district, and turned over to the Palæontologic Department of Stanford University for classification.

Relative to the age of the lower Fernando as compared to prior determinations[5] for this and other districts, Dr. J. P. Smith states in a letter to the writer as follows:

> "I have been working over the fossils from the lower zone and I am quite sure they represent the Jacalitos-Etchegoin horizon—very lowest Pliocene."

The following is a list of part of the fossils referred to: (Identifications were made by H. H. Dievendorff under the direction of Dr. Smith.)

Locality: ½ mile N. of Schuman in R. R. cut.

Arca Trilineata Conrad,
Crepidula princeps Conrad,
Cardium quadrigenarium Conrad var. *fernandoensis* Arnold,
Crysodomus sp.?
Fusus sanctæcrusis,
Glycimerus coalingensis Arnold,
Monia macroschisma Dall,
Natica lewisii Gould,
Ostrea veatchi Gabb,
Oilvella intorta Carpenter,
Psephis sp.?
Panopea generosa Gould,

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[5] The Santa Clara Valley, Puente Hills and Los Angeles Oil Districts—Eldridge & Arnold, Bull. 309, U. S. Geol. Surv., 1907. Geology and Oil Resources of the Summerland District, Arnold, Bull. 321, U. S. Geol. Surv., 1907. Geology and Oil Resources of the Santa Maria District, Arnold & Anderson, Bull. 322, U. S. Geol. Surv., 1907. Paleontology of the Coalinga District, Ralph Arnold, Bull. 396, U. S. Geol. Surv., 1909. The Fernando Group near Newhall, California, Walter A. English, Bull. Univ. of Cal. Dept. Geol., Vol. 8, No. 8—Nov. 7, 1914. Fauna from the lower Pilocene at Jacalitos Creek and Waltham Canyon, Fresno County, Calif. Jorgen O. Nomland; Bull. Univ. of Calif. Dept. of Geol., Vol. 9, No. 14, Feb. 24, 1916. Fauna of the Fernando of Los Angeles, Clarence L. Moody, Bull., Univ. of Calif. Dept. Geol., Vol. 8, No. 8, Oct. 11, 1916. The Geologic Formations of California, James Perrin Smith, Bull. 72, Cal. State Min. Bur., 1916. The Etchegoin Pliocene of Middle California, Jorgen O. Nomland, Bull. Univ. of Calif. Dept. Geol. Vol. 10, No. 14, April 19, 1917.

Phacoides annulatus,
  Pecten ashleyi Arnold,
  Pecten coalingensis Arnold,
  Pecten estrellanus Conrad.
  Pecten hastatus Sowerby,
  Pecten stearnsii Dall,
  Pecten healeyi Arnold,
  Scutella gibbsi Remond,
  Trochita radians,
  Venericardia californica Dall.

The following tabulation gives the names of some of the fauna associated with the sea urchins (*Scutella gibbsi* Remond) in the conglomerate beds:

Name of species	Localities (see list under heading "Conglomerate Outcrops")						
	2	3	4	5	6	7	8
Scutella gibbsi Remond	×	×	×	×	×	×	×
Arca trilineata Conrad	×			×			
Dosinia ponderosa Gray				×			
Marcia oregonensis	×	×					
Macoma nasuta Conrad			×		×		
Modiolus sp. ?					×		
Chione sp. ?			×				
Nasa Moraniana Martin	×		×		×		×
Ostrea veatchi Gabb	×						
Panopea generosa Gould			×				
Tivella crassitaloides		×					
Crab claws					×		

The Fernando brackish water limestone beds and basal conglomerate beds (the latter containing *Scutella gibbsi* Remond) were found to be good Fernando markers. There are numerous outcrops of the limestone on the slopes of the hills flanking the Los Alamos valley. Near the Careaga ranch house in the Purisima hills; in the Careaga Canyon on the north side of the Los Alamos valley; and in several other localities running easterly along the north side of the valley, fresh water springs are found to be associated definitely with the limestone beds. Outcrops of the basal conglomerate beds cover a wide area, and are easily recognized by the fossil sea urchins.

Fernando section.

A cross section of Fernando beds on the north slope of the Purisima anticline, from exposures in the canyon running south from the Careaga ranch house, shows a thickness of 1400± feet between upper Fernando limestone and basal conglomerate.[6] The conglomerate overlies a stratum of fossiliferous yellow sand 400 ft. or more in thickness. This yellow sand is in contact with Monterey shale. Therefore the total thickness from Fernando limestone to Monterey contact is 1800± ft. This columnar relation of conglomerate and yellow or white fossiliferous sand in contact with Monterey shale, is typical for the Santa Maria district. In localized areas there are beds of Monterey breccia at contact. The yellow contact sand varies in thickness. Sometimes it is absent, and the conglomerate rests directly upon Monterey shale. The greatest thickness of sand noted was 400 ft.

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[6] See Columnal Section Pl. II, Bull. 322, U. S. G. S.

Conglomerate outcrops.

The following are some of the localities in which basal conglomerate, containing sea urchins, is found at outcrop:

1. Schuman anticline—in canyon east of road, ½ mile S. W. Arrellanes ranch house, at mouth of Schuman Canyon.
2. Escolle Canyon, 1 mile N. W. Righetti dairy, near Divide.
3. On Purisima anticline in Canyon 1¼ miles south of Careaga ranch house.
4. On Graciosa Ridge-Hartnell, Squires, Brookshire Oil Co. leases. Direct contact with Monterey.
5. Seventeen hundred feet S. 72 deg. W. of U. O. Co. well Harris No. 2.
6. Foxen Canyon, ½ mile south of Tognozzini place.
7. Cat Canyon, immediately east of A. O. Co. well, Williams No. 1.
8. On summit of Solomon hills ¾ mile W. of head of Howard Canyon.
9. One hundred yards east of U. S. Bench Mark at head of Howard Canyon.

In studying the Cat Canyon formation, it will be noted, from the foregoing list, that outcrops on the summit of the Solomon hills running westerly from the head of Howard Canyon to Williams Well No. 1 of the Associated Oil Co. on Section 31, T. 9 N., Range 32 W., S. B. B. & M., are of the basal Fernando (see localities 7, 8 and 9). Williams Well No. 1 was drilled to a depth of 3563 ft. The log of this well conforms closely with that of Union Oil Co. Well No. 3 (Bell) on the westerly edge of the Cat Canyon field, Section 26, T. 9 N., R. 33 W., S. B. B. & M. Each well is close to the anticlinal axis.

If the Cat Canyon oil formations are all of Fernando age, it is possible, from well logs and surface geology, to show that the Ferando is over 6000 ft. thick. This estimate is based on the following: 1600 ft. being the main thickness between Fernando limestone and Monterey contact[7] plus 3563 ft. (depth of Williams Well No. 1) plus a probable 800 to 1000 ft. of sand, clay, fresh water silica, etc., which lies above the Fernando limestone. None of the surface sections observed by the writer, however, include beds older than the basal conglomerate horizon already discussed. Furthermore, the writer has not seen any section of Fernando within the Santa Maria district where it may be said definitely that there are outcrops of oil sand within the section.

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[7] NOTE: Brea deposits and Monterey shale breccia occurring in limited areas at the base of the Fernando are not included in the estimate.

It is true that there are a number of localities where asphaltum or brea deposits, in most cases at visible Monterey contact, hold remnants of Fernando strata. Most of these brea deposits show fossils of a younger horizon than those of the Scutella beds. They indicate an unconformity within the Fernando, probably due to overlap, at some position between the basal conglomerate and limestone beds. Some of these localities are:

1. Waldorf Asphalt Mine,
2. New Pennsylvania Asphalt Mine,
3. Alcatraz Asphalt Mine,
4. Large area of asphaltic sand in the Zaca region,
5. Fugler Point Asphalt Mine.

An examination of the deposits in the localities mentioned shows, with the possible exception of Fugler Point, that the asphaltum has originated directly and locally from eroded Monterey shale. The brea and asphaltum deposits are neither the residue from a movement of oil out of Fernando sand, nor do they indicate the possibility of a petroliferous reservoir at Fernando-Monterey contact. A study of the structure of the Monterey in the Santa Maria district will show that the asphaltum and brea occur at the top of anticlinal folds where oil bearing Monterey beds have been eroded and the oil released. It will show that the brea deposits cited above occur only locally at points of overlap within the Fernando column. It will show that, in the great mass of rocks of Fernando age, which lie on the north flanks of the Schuman and Purisima anticlines and in the Foxen Canyon area, there is no evidence of any oil-bearing stratum from Monterey contact to the youngest part of the Fernando.

Referring to the possible exception at Fugler Point asphalt mine it was noted that within the mine itself there appears to be a Fernando oil sand. The stratum is 1½ to 2 ft. thick. The main body of asphaltum appears to have no definite system of bedding and is commonly described as a "blow-out". This appears to represent the exact condition. From the knowledge of method of occurrence of other brea deposits in the district it would be reasonable to assume that this asphaltum is the remains of oil that had been forced, through fractures, into the Fugler Point Fernando from Monterey beds at no great distance underneath. This assumption would be further supported by the fact that the asphaltum contains many angular fragments of diatomaceous shale, identical in texture. These fragments could not have moved through an oil sand.

Common sources of error.

Aside from the non-existence of outcrops of oil sands in Fernando sections, there are a number of ways in which errors may be introduced into the calculations of Cat Canyon stratigraphy.

One of the most common sources of error, and the one which, if allowed, greatly increases the thickness of the Fernando column, is due to confusion of identity between Terrace and Fernando outcrops. The area lying north of Cañada del Gato and west of Foxen Canyon is usually thought to show both Terrace (Quarternary) and Fernando beds at outcrop. In the canyon just east of the West Oil Co. Well No. 1, Section 30, T. 9 N., Range 32 W., S. B. B. & M., are beds of sand and gravel, dipping gently in a northerly direction, which were thought to be Fernando. In these beds, however, the writer has found, in places, small conglomerate boulders. These conglomerate boulders contain the characteristic fossil *Scutella gibbsi* of the basal Fernando. In other words, a portion of the material composing this Quarternary area was derived from basal Fernando beds.

Relative to the attitude of these proved Terrace deposits, it is noteworthy that a peg model of the oil wells on Section 30, T. 9 N., R. 32 W., S. B. B. & M., shows that an anticline, as indicated by the beds at the surface, does not exist in the oil formations in this area.

Another source of error in locating anticlinal structures for prospecting in this area is due to the use of dips taken on planes of pseudo-stratification both in Terrace and Fernando beds.

In a study of Cat Canyon formations Dr. G. D. Louderback[8] applied the term pseudo-stratification to any structure that closely simulates stratification or bedding both with horizontal attitude and with considerable inclination to the horizontal without relation or reference to the amount of tilting that has been suffered by the formation in which it is found and in no sense an expression of true stratification as being an original laying down of the rock mass layer upon layer on some preexisting basement or floor.

In the Cat Canyon area and elsewhere in the Santa Maria district it is often the case that the pseudo strata are not only quite prominent but are more pronounced than the true strata. This condition will always give misleading dips and sometimes indicate just the opposite of the true structure.

The oil-bearing sand strata.

The presence of these sand strata may be explained through the possible existence of an area of coarser sedimentation in the equivalent of the "big blue" of the Monterey in the Santa Maria field. This explanation is supported by the following conditions:

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[8] Pseudo-Stratification in Santa Barbara County, Calif., by Louderback, Univ. of Cal. Bull. Dept. Geol., Vol. 7, No. 2, pp. 21-38, May 25, 1912.

1. In the Palmer (Stendell) area these sand strata, inter-bedded with blue shade, immediately overlie the oil-bearing brown flinty shales, similar to those of the second oil zone of the Santa Maria and Casmalia fields. In the Santa Maria field the shale horizon overlooking the 2d oil zone is known as the "big blue."

2. There is little variation in the texture of the sand in the strata throughout the Cat Canyon area. It is very fine, in color, and different from any Fernando sand observed elsewhere in the district. In other areas the sand is usually coarse, at times grading into small pebbles.

3. In correlating the productive sand strata in a number of wells drilled on the Santa Maria Oilfields, Pinal Dome, Palmer Union, Union Oil (Bell) and Pan-American properties, it has been observed that the thickness of the sand strata decreases in southerly and westerly directions from approximately the center of the east line of Section 26. 7. 9 N., R. 33 W., S. B. B. & M. It also has been noted definitely in certain wells which appear to be on the westerly edge of the productive area in the Cat Canyon, that at depths where cross-sections from well logs indicated the point for entering productive oil sand, the formation entered was non-productive sandy shale. This would seem to indicate a zone of transition from sand to clay sediments, stratigraphically equivalent.

The following tabulation is made to show the variableness of the different sand and shale members which, taken together, are supposed to be equivalent to the "big blue" of the Santa Maria field:

	NE. ¼ of NW. ¼ of Sec. 27, T. 9 N., R. 33 W., S. B. B. & M.	Northeasterly side S. M. O. F. Palmer-Union area, Sec. 23, T. 9 N., R. 33 W., S. B. B. & M.	Southwesterly side S. M. O. F. Palmer-Union area, Sec. 27, T. 9 N., R. 33 W., S. B. B. & M.	New Penn Brooks area, Sec. 30, T. 9 N., R. 22 W., S. B. B. & M.	Pan-American Union (Bell) area.
*Top of brown shale ----------	Irregular	Irregular	Irregular	Irregular	Irregular
Average thickness heaving tar sand at bottom of brown shale_	21 ft.	12 ft.	30 ft.	Present only in 2 wells, 10 ft. Tar showing at bottom of shale.	Sand absent. Tar showing at bottom of shale.
Average thickness blue shale, bottom of brown to top of oil sand ----------	912 ft.	450 ft.	860 ft.	325 ft.	1,200 ft.
Average thickness top oil sand----	No sand	130 ft.	38 ft.	86 ft.	12 ft.
Greatest thickness any oil sand---	350 ft.(sandy shale)	185 ft.	60 ft.	150 ft.	35 ft.
Top of heaving sand to top of brown flinty shales. (Equivalent "big blue") ----------	Indeterminate	Indeterminate	1,850 ft.	1,630 ft.	Indeterminate

*Probable unconformity here with overlying beds.

4. At the base of the northern slope of the Holland grade, leading south over the hills from Cat Canyon, are strata of diatomaceous shale, inter-bedded with fine yellow sand or sandy shale. The attitude of the strata is unconformable with that of the basal Fernando beds of yellow fossiliferous sandstone and conglomerate which cover the top of Los Alamos peak, and other parts of the Solomon hills in that vicinity. These diatomaceous beds can be traced continuously by outcrops to the Monterey area, three miles to the east in Foxen Canyon. There are numerous fossil casts in these diatomaceous beds, among which are Venericardia sp., and Arca sp. None of the species appear to be definite formational markers. In this connection it was observed that fossil casts are also present in the diatomaceous shales near Pine Canyon in the Santa Maria field, and in the bituminous shale in the old mine above the old Syndicate Oil Co. well on the Schuman anticline. These shales are Monterey.

5. A peg model of wells on Section 30, T. 9 N., R. 32 W., S. B. B. & M., and wells bordering the section, shows that the brown flinty-shales, already mentioned as being the probable equivalent of 2d zone formations in the Santa Maria field, are not only conformable with the productive sands, but that they are formed into a dome structure. The fact that these brown flinty-shales are logged in wells drilled in Sec. 30, but have not as yet been entered in wells drilled on Section 26, T. 9 N., R. 33 W., might be held as proof by some that there is an unconformity between these shales and the overlying productive oil sands. Aside, however, from the evidence of the peg model already cited, a study of the foregoing tabulation of thicknesses of strata will show that there is a marked increase westerly in the thickness of shale bodies, comparing those of Section 30, T. 9 N., R. 32 W., with those of Section 26, T. 9 N., R. 33 W.

Gravity of the oil.

There is a difference of 10 to 15 degrees Baumé in the gravities of Cat Canyon petroleum and that produced in the Santa Maria field, the former being the lower. It can hardly be held that geologic age influences the gravity of oil and as an instance of the variation in gravities elsewhere, the Casmalia field production is cited. This production, which varies from 8.8 deg. to 17 deg. Baumé, is known to come from the Monterey formations.

It is possible to find an explanation of the difference in the physical characteristics of the oils by considering the geologic structure of the Cat Canyon, Santa Maria and Casmalia fields. In the Santa Maria field the petroleum, excluding the first oil zone, lies in a closed dome. There has been no apparent opportunity for the petroleum or any of its higher fractions to escape; there may have been opportunity for minor fractionations within the dome.

The formations of the Cat Canyon area are exposed in numerous places, such as at Fugler Point, Alcatraz Asphalt Mine, Zaca Creek, etc., and enormous quantities of petroleum have escaped from the Monterey shales in this area. The same condition holds for the northerly end of the Schuman anticline of the Casmalia field, where almost the entire series of the Monterey formation is exposed in successive outcrops, progressing in a westerly direction toward the ocean. There is much asphaltum in this locality, and it would appear that the exposures of "mother shales" in the Cat Canyon and Casmalia areas has not only permitted the loss of large quantities of petroleum, but also a portion of the lighter fractions of the petroleum that remains.

DECISIONS.

CAT CANYON FIELD.

T. 9 N., R. 32 W., S. B. B. & M.

SECTION 29.

Palmer Union Oil Co.

Well No. 12, abandon. BB-90.

Proposal to abandon account of no production approved.

Well No. 13, abandon. BB-46.

Proposal to abandon account of no production approved.

SECTION 30.

West Oil Co.

Well No. 1, abandon. BB-33.

Proposal to abandon approved. Notice of intention to abandon was later canceled account of considerable oil showing in the well during work preparatory to abandonment.

J. W. Goodwin.

Well No. 2, abandon. BB-21.

Proposal to abandon approved. Notice of intention to abandon was later canceled. See following report BB-67, for further history on operations at this well.

West States Petroleum Co.

Well No. 2, perforate casing. BB-67.

Some time after the notice of intention to abandon, J. W. Goodwin Well No. 2 had been canceled, the West States Petroleum, now the United Western Consolidated, took over the well and submitted proposal to perforate 6¼″ casing from 2615′ to 2800′. Their intention was to obtain production from formations corresponding stratigraphically to those from which the Palmer Union Oil Co. is producing through the 8¼″ casing in Stendell Well No. 1. From data at hand the Deputy recommended that 6¼″ casing be perforated between depths of 2390′ and 2670′, instead of at the depths proposed, in order to get the production desired. Production was increased from 10 barrels per day to 150 barrels per day.

Palmer Union Oil Co.

Well No. 2, shut-off. B-53.

Shut-off a failure. Recommended cementing a string of 10″ casing.

Well No. 2, Stendell, shut-off. B-68.

Shut-off not conclusive. Later developments showed presence of another water sand at a short distance below.

Palmer Union Oil Co.

Well No. 2, Stendell, shut-off. B-105.

Shut-off successful. Water sands, unexpected and unusual to the territory, made three shut-offs necessary in this well.

Well No. 3, shut-off. B-56.

Shut-off successful.

Well No. 3, shut-off. B-80.

Shut-off successful.

Well No. 3, Stendell, shut-off. B-98.

Shut-off not successful. Deputy made the following conclusions as to probable source of water:

1st: From back of 6¼″ casing.

2d: Drilling water returned from formations below the 6¾″, logged at depth of 2963′.

3d: Water native to formations, but not logged between depths of 2995′ to 3264′.

4th: Water let into formations between depths of 2963′ and 3234′ by Stendell water well (old Standell No. 13).

The Deputy also made the following recommendations:

1st: Immediately place all available information relative to Stendell Well No. 13 at the disposal of this department.

2d: Set a 4½″ liner in Stendell Well No. 3, and make pumping test to determine the productivity of supposed oil formations below the 6¼″ shut-off.

In explanation of the foregoing, it may be stated that Stendell Wells Nos. 2 and 3 were being drilled at the same time in territory in which unusual water conditions developed.

New Pennsylvania Petroleum Co.

Well No. 1, abandon. BB-32.

Proposal to abandon approved.

Well No. 1, shut-off. B-27.

Cement plug in water string, on abandonment job, tested for depth by this department.

SECTION 31.

Brooks Oil Co.

Well No. 2, abandon. BB-92.

Work of abandonment on this well was started without the knowledge or approval of this department. On June 16th, however, notice of intention to abandon was filed and approved.

J. W. Goodwin Oil Co.

Well No. 1, deepen. BB-50.

Proposal to deepen approved.

Well No. 1, shut-off. B-65.

Shut-off satisfactory.

Pinal Dome Oil Co.

Well No. 2, Santa Maria Enterprise, redrill. BB-69.

Proposal to redrill approved. Recommended cementing a string of 6¼″ casing at a depth of 2010′

Associated Oil Co.

Well No. 4, shut-off. B-25.

Shut-off satisfactory.

Well No. 4, shut-off. B-37.

Shut-off satisfactory.

T. 9 N., R. 33 W., S. B. B. & M.

SECTION 22.

Pinal Dome Oil Co.
  Well No. 3 LF, shut-off. B-57.
    Shut-off satisfactory.
  Well No. 2 LF, shut-off. B-19.
    Shut-off satisfactory.

SECTION 23.

Santa Maria Oil Fields, Inc.
  Well No. 3, redrill. BB-42.
    Proposal to redrill approved.
  Well No. 3, redrill. BB-65.
    Proposal to redrill approved.
  Well No. 8, shut-off. B-108.
    Shut-off satisfactory.

Palmer Union Oil Co.
  Well No. 8, abandon. BB-44.
    Proposal to abandon approved.
  Well No. 8, shut-off. B-46.
    Witnessed test for cement plug in water string on abandonment job.

SECTION 26.

Pinal Dome Oil Co.
  Well No. 7-B, shut-off. B-21.
    Shut-off satisfactory.
  Well No. 7-B, shut-off. B-35.
    Shut-off satisfactory.

Union Oil Co.
  Well No. 4, Bell, redrill. BB-35.
    Proposal to redrill approved.

Palmer Union Oil Co.
  Well No. 2, redrill. BB-52.
    Proposal to redrill liner approved.
  Well No. 6, abandon. BB-40.
    Proposal to abandon approved.
  Well No. 7, abandon. BB-43.
    Proposal to abandon approved.
  Well No. 7, shut-off. B-34.
    Witnessed test for position of cement plug in water string on abandonment job.
  Well No. 9, abandon. BB-45.
    Approved proposal to abandon.
  Well No. 9, shut-off. B-52.
    Witnessed test for position of cement plug in water string on abandonment job.

SECTION 27.

Santa Maria Oil Fields, Inc.
  Well No. LF-1, redrill. BB-38.

Original hole abandoned at 2100′ account being crooked. Left some casing in hole. No productive sands entered. Moved rig 24′ and started new hole. In drilling new hole, at about 1200′, the drill struck the casing and junk in the old hole.

  Well No. 1-LF, abandon. BB-57.
    Proposal to abandon approved.
  Well No. 2, Bell, shut-off. B-91.
    Shut-off satisfactory.

Santa Maria Oil Fields, Inc.

Well No. 2-B, abandon. BB-83.

Proposal to abandon approved.

Well No. 2, abandon. BB-91.

6¼″ casing froze in the hole account of shifting formations, causing a bend in the pipe. Proposal to shoot and plug in shales between various oil sands approved.

Bell Ranch.

Oilfields Syndicate (W. P. Hammon).

Well No. 1, plug off bottom, redrill. BB-59.

This company proposed to shoot off 6¼″ casing at a depth of 3100′, and plug with cement back to 2991′, in order to exclude water thought to be coming from below the productive oil sands. Proposal was approved. Subsequent pumping tests showed that free water had been eliminated, although the well still shows 12% emulsion.

Pan-American Petroleum Investment Corporation.

Well No. 1, shut-off. B-44.

Shut-off approved, upon statement of superintendent.

Well No. 2, shut-off. B-38.

Shut-off approved.

Well No. 3, shut-off. B-45.

Shut-off approved, upon statement of superintendent.

Well No. 4, shut-off. B-50.

Shut-off approved.

Well No. 4, shut-off. B-107.

Second shut-off made to exclude salt water logged in sand between depths of 2845′ and 2870′. This sand seems to correlate with oil sand in wells farther to the northwest. Possible edge-water conditions. Shut-off satisfactory.

Well No. 6-A, "Temporary," shut-off. B-61.

Shut-off satisfactory.

Well No. 7-A, "Temporary," shut-off. B-71.

Shut-off passed as satisfactory upon statements of superintendent.

Well No. 8-A, "Temporary," shut-off. B-100.

Shut-off passed as satisfactory upon statements of superintendent.

Well No. 13-A, "Temporary," shut-off. B-76.

Shut-off passed as satisfactory upon statements of superintendent.

Well No. 13-A, "Temporary," shut-off. B-90.

This shut-off was made without consulting this department. When the well was drilled ahead after shut-off as recorded in Report B-76, a salt water stratum, with fluid level of 900′, was entered at depths of 2561′ to 2579′. This water stratum appears to correlate with the first slightly productive oil sand entered in wells to the west. Here is additional evidence of a possible edge-water condition. This shut-off was satisfactory.

Well No. 15-A, "Temporary," shut-off. B-95.

Shut-off passed as successful upon statements of superintendent.

Well No. 15-A, "Temporary," shut-off. B-111.

This shut-off was made without the knowledge of this department. Owing to shortage of help in the Santa Maria office at this time it was difficult for the Deputy to keep in personal touch with Pan-American operations, and in this particular instance, as well as that cited in Report B-90, we were not kept informed of these unusual water conditions.

This shut-off was made to exclude salt water logged between depths of 2690′ and 2705′. Fluid level was 880′. As this water stratum appears to correlate with oil strata in wells farther to the northwest, this would appear to be another instance of edge-water.

Shaw Ranch.

Standard Oil Co.

Well No. 3, shut-off. B-55.

Shut-off approved.

Well No. 3, shut-off. B-87.

Shut-off not successful. No water logged back of the string of pipe. Shut-off made as a precautionary measure. Well passed for production test. Water, which appeared in bailing test, was thought to be drilling water held behind the casing.

SANTA MARIA FIELD.

T. 9 N., R. 33 W., S. B. B. & M.

SECTION 19.

Rice Ranch Oil Co.

Well No. 1, deepen. BB-47.

Proposal approved.

New Pennsylvania Petroleum Co.

Well No. 2, deepen. BB-58.

Proposal to deepen approved. Deepened 5′ to increase production.

Well No. 8, shut-off. B-66.

Shut-off satisfactory.

T. 9 N., R. 34 W., S. B. B. & M.

SECTION 22.

Union Oil Co.

Well No. 4, Hartnell, deepen. BB-60.

Proposal to deepen approved with understanding that second zone formations will be sealed with cement.

SECTION 24.

Pinal Dome Oil Co.

Well No. 8, Graciosa, deepen. BB-22.

Proposal to deepen approved. Recommended sealing second zone formations with cement.

Well No. 13-A, shut-off. B-29.

Shut-off approved.

Well No. 23-P, shut-off. B-23.

Shut-off approved.

Los Alamos Rancho.

Well No. 1, Graciosa, deepen. BB-54.

Proposal to deepen approved with understanding that second oil zone formations will be sealed with cement in making a shut-off before entering the third oil zone.

Well No. 2, Harris, shut-off. B-64.

Shut-off satisfactory.

Well No. 5, Graciosa, cement string of 4½″. BB-81.

Water appeared in the shales beneath the 6¼″ shut-off. It was originally intended to carry the 6¼″ casing below to second zone water, but the shut-off was probably made too high. It was therefore necessary to cement an additional string of casing in order to exclude waters below the 6¼″ shut-off from the third oil zone.

Western Union Oil Co.

Well No. 3, remove casing. BB-85.

Proposal to remove portion of oil string approved.

Well No. 38, deepen. BB-70.

Proposal to clean out and deepen about 100′ approved.

Western Union Oil Co.

Well No. 38, abandon. BB-80.

Work of abandonment completed without notice being filed with this department. Subsequent review of the records as to work of abandonment showed that the work had been performed in a manner satisfactory to this department.

Well No. 58. Shut-off. B-47.

Shut-off satisfactory.

Well No. 58, shut-off. B-18.

Shut-off satisfactory.

Well No. 59, redrill. BB-56.

This well was formerly known as No. 35, and had been abandoned after losing a string of tools. The proposal to erect a derrick over the well and clean out to first oil zone was approved.

Well No. 60, shut-off. B-33.

Shut-off satisfactory.

Well No. 61, shut-off. B-72.

Shut-off satisfactory.

Newlove Lease.

Union Oil Co.

Well No. 5, Newlove, deepen. BB-19.

Proposal to deepen approved, with understanding that second oil zone formations will be sealed with cement.

Well No. 5, Newlove, shut-off. B-85.

Shut-off satisfactory.

Well No. 6, Newlove, deepen. BB-34.

Proposal to deepen approved with understanding that second oil zone formations will be sealed with cement.

Well No. 6, Newlove, shut-off. B-84.

Well flowed and could not make bailing test. Production test showed shut-off to be satisfactory.

Well No. 14, Newlove, abandon. BB-31.

Proposal to abandon approved.

Well No. 44, Newlove, shut-off. B-67.

Formation shut-off passed as satisfactory upon statements of superintendent.

Well No. 17, Newlove, shut-off. B-51.

Shut-off satisfactory.

Well No. 17, Newlove, deepen. BB-20.

Proposal to deepen approved. Intention to shut off below, and seal, second zone formations with cement.

Well No. 33, Newlove, deepen. BB-61.

Proposal to deepen approved with understanding that second zone will be sealed with cement.

Well No. 43, Newlove, abandon. BB-37.

Proposal to abandon approved.

Section 34.

Union Oil Co.

Well No. 4, Cal. Coast, deepen. BB-48.

Proposal to deepen approved with understanding that second oil zone will be sealed with cement.

CASMALIA FIELD.

T. 9 N., R. 34 W., S. B. B. & M.

Punta de la Laguna Rancho.

Doheny Pacific Petroleum Co.

Well No. 1, Soladino, shut-off. B-30.

Shut-off approved upon statement of superintendent. Test made without informing this department.

Doheny Pacific Petroleum Co.

Well No. 1, Soladino, shut-off. B-41.

Shut-off satisfactory.

Well No. 1, Soladino, redrill. BB-63.

Proposal to bridge and cement string of 10″ in order to make shut-off stratigraphically uniform with that of neighboring wells approved.

Well No. 2, Soladino, shut-off. B-31.

Test for shut-off approved upon statement of superintendent. Test was made and the well drilled ahead before this department was notified.

Well No. 2, Soladino, shut-off. B-40.

Shut-off satisfactory.

Well No. 3, Soladino, shut-off. B-32.

Deputy was not present at this test, due to misunderstanding as to what kind of tests should be witnessed. Shut-off approved, however, upon statement of superintendent.

Well No. 3, shut-off. B-43.

Shut-off satisfactory.

Well No. 3, Soladino, re-cement. BB-87.

Proposal to bridge and cement a string of 10″ casing in order to make a shut-off stratigraphically uniform with those in adjacent wells, approved.

Well No. 4, Soladino, shut-off. B-39.

Shut-off satisfactory.

Well No. 4, Soladino, re-cement. BB-86.

Proposed to bridge and cement string of 12½″ casing in order to make shut-off stratigraphically uniform with shut-offs in adjacent wells, approved.

Well No. 5, Soladino, shut-off. B-42.

Shut-off satisfactory.

Well No. 5, Soladino, re-cement. BB-88.

Proposal to bridge and cement a string of 10″ casing in order to make a shut-off stratigraphically uniform with shut-offs in adjacent wells, approved.

Well No. 6, Soladino, shut-off. B-69.

Shut-off not satisfactory. Well was passed with understanding that another string of casing would be cemented before entering producing formations.

Well No. 6, Soladino, shut-off. B-88.

See report B-69. Shut-off satisfactory.

Well No. 7, Soladino, shut-off. B-60.

Shut-off satisfactory.

Well No. 7, Soladino, shut-off. BB-66.

On account of heaving formations, unable to make bailing test. Well was passed for drilling into producing formations, and pumping test for shut-off.

Well No. 11, Soladino, drill. BB-72.

Proposed point of shut-off rejected account of no provision being made for protection of the "Big Brown" tar-bearing formations. Recommended either cement and string of casing at top of "Big Brown" formation or cementing a string of casing 250′ lower than proposed depth of shut-off, using sufficient cement to seal all "Big Brown" formations.

Well No. 12, Soladino, drill. BB-78.

Proposed depth of shut-off rejected account of no protection provided for "Big Brown" tar-bearing formations. Made recommendations similar to those in Report BB-72.

Well No. 14, Soladino, drill. BB-77.

Proposed depth of shut-off rejected. Reasons and recommendations similar to those in reports BB-72 and BB-78.

Well No. 39, Soladino, drill. BB-71.

Approval of proposed shut-off withheld until company furnished facts to show why shut-off should be made at the depth as proposed.

Well No. 40, Soladino, shut-off. B-73.

Shut-off satisfactory.

Doheny Pacific Petroleum Co.

Well No. 40, Soladino, bridge and additional shut-off. BB-82.

Proposal to bridge and cement string of 10″ casing in order to shut off water entered after drilling below point of shut-off covered in report B-73, approved.

Well No. 1, Lease 1, shut-off. B-48.

Shut-off satisfactory.

Well No. 2, Lease 1, shut-off. B-70.

Shut-off satisfactory.

Well No. 2, Lease 1, cement additional casing. BB-93.

Proposal to bridge and cement a string of 10″ casing, in order to make a shut-off stratigraphically uniform with shut-offs in the adjoining wells, approved.

Well No. 3, Lease 1, drill. BB-76.

Recommendations on proposed depth of shut-off withheld until the company furnish this department with the logs of completed wells on Lease No. 1.

Well No. 3, Lease 1, drill. Supplementing Report BB-76.

Logs required in Report BB-76 received by this department, and proposed depth of water shut-off approved.

Well No. 3, Lease 1, shut-off. B-99.

Shut-off satisfactory.

Well No. 4, Lease 1, shut-off. B-63.

Shut-off satisfactory.

Well No. 4, Lease 1, shut-off. B-74.

Shut-off satisfactory.

Well No. 5, Lease 1, shut-off. B-82.

Shut-off satisfactory.

Well No. 6, Lease 1, drill. BB-74.

Recommendations on proposed depth of shut-off withheld until the company furnished this department with the logs of all completed wells on Lease 1.

Well No. 6, Lease 1, drill. Letter supplementing Report BB-74.

Logs required in Report BB-74 received. Proposed depth of shut-off approved.

Well No. 7, Lease 1, shut-off. B-81.

Shut-off not entirely satisfactory. Well passed for drilling into productive formations with recommendation for one month's pumping test.

Well No. 7, Lease 1, shut-off. B-94.

Shut-off satisfactory. Cemented additional string of casing account of small amount of water. See Report B-81.

Well No. 10, Lease 1, drill. BB-75.

Recommendations on proposed depth of shut-off withheld until the company furnished this department with the logs of all completed wells on Lease No. 1.

Well No. 10, Lease 1, drill. Letter supplementing Report BB-75.

Logs required in Report BB-75 received. Recommended shut-off in suitable formations at depth between 900 to 950′, instead of depth of 1050′ as proposed,

Well No. 11, Lease 1, drill. BB-79.

Recommendations on proposed depth of shut-off withheld until the company furnished this department with the logs of all completed wells on Lease No. 1.

Well No. 11, Lease 1, drill. Letter supplementing Report BB-79.

Logs required in Report BB-79 received. Proposed depth of water shut-off approved.

Well No. 14, Lease 1, drill. BB-73.

Recommendations on proposed depth of shut-off withheld until the company furnished this department with the logs of all completed wells on Lease No. 1.

Well No. 14, Lease 1, drill. Letter supplementing Report BB-73.

Logs required in Report BB-73 received. Proposed depth of water shut-off approved.

Well No. 1, Lease 2, shut-off. B-83.

Shut-off not satisfactory. Recommended casing be tested for possible leaks.

Well No. 1, Lease 2, test casing. BB-64.

As per recommendations in Report B-83, superintendent stated that casing was found to be not sufficiently tightened. It was set up a total of 18″. Well was then bailed to bottom, and after standing 12 hours a bailing test showed shut-off to be satisfactory.

Well No. 5, Lease 2, shut-off. B-92.

Shut-off satisfactory.

Well No. 6, Lease 2, shut-off. B-110.

Shut-off satisfactory.

Casmalia Syndicate.

Well No. 2, Arrellanes, redrill. BB-41.

This is old No. 1 well of the Producers Oil and Transportation Co. The proposal of the Casmalia Syndicate to redrill this well and cement a string of 10″ casing was approved.

Well No. 2, Arrellanes, shut-off. B-49.

Shut-off satisfactory.

Associated Oil Co.

Well No. 2, Arrellanes, bridge and cement. BB-95.

This is the Casmalia Syndicate well referred to in Reports BB-41 and B-49. The property was taken over by the Associated Oil Co. The Associated's proposal to plug bottom and bridge and cement a string of 8¼″ casing at 1400′ in order to test for possible bottom water, was approved with the understanding that every effort would be made to redrill this well to old bottom before plugging.

Casmalia Syndicate.

Well No. 5, Arrellanes, shut-off. B-78.

Shut-off satisfactory.

Well No. 6, Arrellanes, shut-off. B-79.

Shut-off satisfactory.

Associated Oil Co.

Well No. 6, Arrellanes, shut-off. B-96.

This is the Casmalia Syndicate well referred to in Report B-79. Shut-off satisfactory.

T. 9 N., R. 35 W., S. B. B. & M.

Punta de la Laguna Rancho.

Casmalia Syndicate.

Well No. 3, S. P. Lease, shut-off. B-86.

Shut-off satisfactory.

Associated Oil Co.

Well No. 3, S. P. Lease, shut-off. B-106.

This is the Casmalia Syndicate well referred to in Report B-86. Shut-off satisfactory.

Casmalia Syndicate.

Well No. 2, S. P. Lease, shut-off. B-20.

Shut-off satisfactory.

Associated Oil Co.

Well No. 2, S. P. Lease, cement and plug. BB-94.

This is the Casmalia Syndicate well referred to in Report B-20. Associated's proposal to cement string of 10″ at 1640′ and plug bottom of hole if there are indications of bottom water, is approved.

T. 9 N., R. 34 W., S. B. B. & M.

SECTION 19.

Associated Oil Co.

Well No. 21, Peshine, shut-off. B-93.

Shut-off not satisfactory. Recommended that another attempt at shut-off be made.

Associated Oil Co.

Well No. 21, Peshine, shut-off. B-109.

Test for shut-off not satisfactory. Recommended recementing, redrilling, or landing another string of casing.

Well No. 31, Peshine, drill. BB-84.

Recommended point of shut-off at about 1050′ instead of at about 950′ as proposed.

SECTION 20.

Pinal Dome Oil Co.

Well No. 2, Escolle, shut-off. B-22.

Formation shut-off satisfactory.

Well No. 5, Escolle, shut-off. B-114.

Shut-off satisfactory.

T. 10 N., R. 35 W., S. B. B. & M.

Pezzoni Ranch.

Standard Oil Co.

Well No. 1, Pezzoni, shut-off. B-36.

Shut-off reported successful upon statement of superintendent.

Tognozzini Ranch.

Standard Oil Co.

Well No. 1, Tognozzini, shut-off. B-24.

Shut-off not satisfactory. Well passed for further drilling, with recommendation that a string of 8¼″ casing be cemented before permanently entering any productive oil formations.

Well No. 1, Tognozzini, shut-off. B-54.

Shut-off satisfactory.

LOS ALAMOS FIELD.

T. 7 N., R. 31 W., S. B. B. & M.

SECTION 1.

Standard Oil Co.

Well No. 1, Laguna, shut-off. Letter 6/6/17.

The letter requested data on 10″ shut-off in this well. Shut-off not successful.

LOMPOC FIELD.

T. 8 N., R. 34 W., S. B. B. & M.

SECTION 28.

Orcutt Oil Co.

Well No. 2, deepen. BB-51.

Proposal to deepen to increase production approved.

Well No. 2, plug bottom. BB-89.

In deepening another water stratum was encountered, and proposal to plug back to original depth was approved.

Pacific Oil Fields Ltd.

Well No. 5, abandon. BB-27.

Proposal to abandon approved. Work done by Midway Supply Co. under direction of this department.

Well No. 6, abandon. BB-28.

Proposal to abandon approved. Work done by Midway Supply Co. under direction of this department.

Well No. 7, abandon. BB-29.

Proposal to abandon approved. Work done by Midway Supply Co. under direction of this department.

Orcutt Oil Co.
Well No. 8, abandon. BB-30.
Proposal to abandon approved. Work done by Midway Supply Co. under direction of this department.

SECTION 33.

Pacific Oil Fields, Ltd.
Well No. 1, abandon. BB-24.
Proposal to abandon approved. Work done by Midway Supply Co. under direction of this department.
Well No. 3, abandon. BB-25.
Proposal to abandon approved. Work done by Midway Supply Co. under direction of this department.
Well No. 4, abandon. BB-26.
Proposal to abandon approved. Work done by Midway Supply Co. under direction of this department.

ARROYO GRANDE FIELD.

T. 31 S., R. 13 E., M. D. B. & M.

SECTION 31.

B. B. & E. R. Dudley Petroleum Co.
Well No. 5, shut-off. B-89.
Shut-off approved upon statements of superintendent.
Well No. 1, McNee, redrill. BB-49.
Proposal to redrill approved.
Well No. 1, McNee, shut-off. B-62.
Shut-off satisfactory. Work carried out as per recommendations in Report BB-49.
Well No. 1, Muchado, deepen. BB-36.
Proposal to carry oil string 75′ deeper approved.

East Puente Annex Oil Co.
Well No. 6, Tiber, shut-off. B-28.
Shut-off satisfactory.

T. 32 S., R. 13 E., M. D. B. & M.

SECTION 6.

Louis Titus.
Well No. 1, shut-off. B-77.
Prospect well. Shut-off satisfactory.

SECTION 18.

Highway Oil Co. (J. E. O'Donnell.)
Well No. 1, shut-off. B-97.
Prospect well near the town of Arroyo Grande.

BRADLEY FIELD.

T. 24 S., R. 10 E., M. D. B. & M.

SECTION 36.

Associated Oil Co.
Well No. 1, King, deepen. BB-68.
Prospect well. Proposal to deepen to 1500′ approved.

PARKFIELD.

T. 23 S., R. 14 E., M. D. B. & M.

SECTION 8.

W. W. Garland.
Well No. 1, deepen. BB-62.
Prospect well. Proposal to deepen approved.

SARGENT FIELD.

T. 11 N., R. 4 W., M. D. B. & M.

SECTION 31.

Gilroy Oil Co.
Well No. 6, deepen. BB-23.
Proposal to deepen approved.
Well No. 7, shut-off. B-26.

First test not satisfactory. Well was then bridged below point of shut-off and upon bailing was found to be dry. Shut-off passed upon statement of superintendent.

Well No. 7, abandon. BB-53.
Proposal to abandon and convert into a water well approved.
Well No. 8, abandon. BB-55.

Proposal to shut-off water from oil sands with cement plugs and pull pipe approved.

Well No. 10, shut-off. B-58.
Shut-off passed as satisfactory upon statements of superintendent.
Well No. 11, shut-off. B-59.
Formation shut-off passed as satisfactory upon statements of superintendent.
Well No. 12, shut-off. B-75.
Shut-off satisfactory.

MISCELLANEOUS.

T. 3 N., R. 3 W., M. D. B. & M.

SECTION 4.

Wm. Hauhuth.
Well No. 1, commence drilling. Notice.
Prospect well near Vallejo, Cal.

CHAPTER IV.

KERN COUNTY.

By R. N. Ferguson.

ORGANIZATION AND DISTRICT.

The past year has been essentially a year of growth in both the office force and in the method of handling the work of the department in this district. The year began with Deputy Supervisor Chester Naramore, alone, in charge of a district embracing the McKittrick, Midway, Sunset and Kern River fields. Much credit is due Mr. Naramore for his pioneer work in this field. In this work, he established the department on a friendly basis with the operators and furnished us practically complete records of the operations during the previous year in the district, together with much technical information.

Late in July, 1916, the writer was appointed inspector under Mr. Naramore. On account of additional help, the district to be handled from the Taft office was enlarged on September 12 to include all territory in the San Joaquin Valley south of the south line of Township 22 South, and including the Carrizo and Cuyama country. This brought the Belridge and Lost Hills fields into the district and added materially to the work of this office. Mr. Naramore resigned from the department October 1, 1916, to accept appointment as Chief Petroleum Technologist for the U. S. Bureau of Mines. The writer was appointed Deputy Supervisor to fill the vacancy.

On October 3, 1916, Mr. R. D. Bush was appointed to the Taft office as Inspector to handle the work of the McKittrick, Lost Hills and Belridge districts, which position he held until he received the appointment to the office of Deputy Supervisor at Coalinga during the latter part of February, 1917.

On October 5, 1916, a branch office was opened at Bakersfield with Inspector G. McGregor in charge. This greatly facilitated the work of the department in the Kern River field.

GENERAL SUMMARY.

During the year harmonious co-operation between the operators and this department has prevailed in most cases. The department has at all times stood ready to meet the operators half way in arriving at an understanding where differences of opinion have developed. Such differences are unavoidable where proposals are hastily gotten up and often omit information of vital importance. Such omissions put the department in the position of either having to send out and investigate the history of the well in question, or of assuming that it is in the worst possible condition. In the rush of handling work that has come before us, it has been impossible to follow the former course, and consequently we have, in many cases, written decisions which aimed to cover every conceivable condition which might affect the well.

In most cases, this procedure has had the desired result of causing the operator to furnish further facts of the case. It has been our experience that when all the facts are brought out in a case there is very seldom any difference between the deductions drawn from them by this department and those drawn by the operators after they have studied the facts.

The most serious misunderstandings that we have had have resulted from failure of the operators to take up their side of questions with us before doing the work. It can readily be seen that a statement that some work we have specified is unnecessary, in view of certain facts, would appear in better light to us if made before instead of after the work has been completed.

The increased force has enabled this department to do the field work in greater detail. In the Kern River field, it has been possible to keep in touch with the important repair and abandonment jobs in addition to the regular work of witnessing tests of shut-off and the incidental office work. In the remainder of the fields some critical cementing jobs have been witnessed, and many fluid level measurements have been made, in addition to the routine work.

In order to accomplish this, it has been necessary in certain cases to pass tests of shut-off without a visit by an inspector. The majority of such cases have been passed on the report of the operator that no satisfactory bailing test could be made. In territory known to be free from ''top'' water, other tests have of necessity been passed without inspection and in some emergency cases written reports of tests by the operators have been accepted in lieu of inspection.

An active drilling campaign continued throughout the year in this district. There were 467 new wells started, exclusive of those in Lost Hills and Belridge, as against 276 new wells in the same district during the preceding year. In the Lost Hills and Belridge fields which have been in this district since October, 1916, there have been 171 new wells started during the fiscal year, as against 108 for the preceding year.

The following table will show the work that has been handled at the Taft office during the year:

NOTICES AND DECISIONS.

Kern County.

Field	Wells begun	Wells abandoned	Wells redrilled or deepened	Wells tested for water shut-off	Work witnessed
Lost Hills	92	3	48	60	----------
North Belridge	4	2	8	17	----------
Belridge	74	5	4	44	----------
Wild Cat Territory	1	2	----------	2	----------
McKittrick Front	7	1	6	27	1
McKittrick	40	12	20	34	----------
Midway	298	34	135	279	19
Sunset	56	21	57	68	10
Kern River	66	19	82	98	----------
Total Taft District	638	99	360	629	30

The number of wells in this district and the number of logs on file are shown by the following tabulation. Graphic logs are being drawn as fast as possible. The number already completed is also shown in the tabulation:

Field	Number wells	Number logs	Graphic
Lost Hills	420	317	4
North Belridge	24	14	5
Belridge	216	170	1
McKittrick	561	315	88
Midway	2,246	1,542	588
Sunset	743	296	102
Kern River	2,426	1,749	310
Wild cat	23	3	----------
Totals	6,659	4,406	1,098

Peg models covering about 6500 acres, or 12% of the proved land in the district, have been constructed. The proved area in the district, as shown by the list prepared for assessment purposes, is 56,122 acres.

In the work of testing wells and witnessing mudding and cementing operations, approximately fifty thousand miles of automobile travel has been necessary. While this may give some idea of the amount of outside work handled, it has no bearing on the important phase of our work, that of compiling the information submitted to us in such form as to enable us to give intelligent consideration to the various problems with which the operators are confronted.

The compilation of information and consideration of problems necessitates a detailed knowledge of underground structure which can only be gained by careful use of all available information in the form of maps, drawings, peg models, and tabulations. Much of the information on which work must be based has been slow in coming in, and consequently, we have not had complete information on any very large area. The areas in which completed work has shown valuable results are covered in detail in following paragraphs.

In some areas the work has not progressed to a final stage, either because of lack of data or lack of time. At the close of the year, better progress is being made than at any time so far, and the idea is being kept steadily in view of eventually working out in detail the geological structure of every part of each field.

SUNSET FIELD.

MARICOPA FLAT AND THIRTY-FIVE ANTICLINE.

Early in the year, the question of methods of producing the gusher sands, and at the same time protecting the upper sands in the Maricopa flat, was put up to this department. The problem had many angles which it is no part of this report to go into, but the prime need in working it out was for detailed knowledge of the underground conditions. Under Mr. Naramore's guidance, a small peg model was constructed which helped very materially in getting a correct understanding of these conditions. This area embraces Sections 31, 32 and 33, Township 12 North, Range 23 West, and Sections 4 and 5, Township 11 North, Range 23 West, S. B. B. & M., and represents the north limb of the ''Thirty-Five'' anticline in the Sunset field.

The bureau was fortunate in having the co-operation of a number of progressive operators in this district. Information was at all times freely exchanged, and, while at the start there was some disagreement as to the conclusions, the close of the year found practically all operators and this department in accord as to the sequence of beds and the correlations between wells and properties.

The general geology has been well described in Bulletin No. 406, U. S. G. S., and it is merely necessary here to go more thoroughly into the details of oil and water zones encountered from the surface downward. Typical wells show from 500 to 1000 feet of porous water-bearing formation. Below this, blue clays and shales predominate to the first productive sand of ''Zone A''. Above ''Zone A'', a comparatively shallow tar sand is frequently reported, but the occasional sands in the blue beds are generally logged as water sands. In drilling to produce the top sand of ''Zone A'', it has been found necessary to shut off water very close above the oil. This ''Zone A'' sand has not been generally produced from on account of the difficulty of locating it in the ordinary manner of drilling, with a hole full of water. It frequently makes no showing whatever.

In order to definitely locate the "Zone A" oil, two things are necessary: First, it is essential to have the top water shut off when the sand is entered; second, it is essential that the hole be tested by bailing before it has penetrated the upper intermediate water which lies very close below. Between the two necessities, the operator is not allowed much leeway as the zone is seldom over 50′ in thickness. Many wells have been unintentionally drilled through the sand by very careful operators. Wells producing from this sand average better than 100 bbls. per day of from 19° to 22° (Baumé) gravity oil.

The upper intermediate water lying just below this "Zone A" oil is, or was originally, a flowing water in the eastern portion of the area. Fortunately, it is separated from the oil by solid and impervious shells, which fact alone makes it possible to produce the oil without letting the water in. The areal extent of this water-bearing sand is not exactly known. The latest information indicates that towards the west the same sand carries oil at least along and near the axis of the anticline, and it is probable that it originally carried oil over a much greater area and that the water now occurring in it is an "edge water".

Below the water above described is the second oil, an oil of slightly higher gravity and equal productivity. Only a few wells have produced this oil, owing perhaps to the difficulty of finding it. In early drilling it was usually encountered while the hole was open to the flowing water which rendered it almost impossible for the oil to show. This has been termed the "Kinsey" sand. It was encountered in Well No. 1 of the Midway Field Oil Company, Section 4, T. 11 N., R. 23 W., S. B. B. & M. at about 2767′ and showed oil of 24° (Baumé) gravity. A number of wells drilled at an early date do not properly protect this sand, and it is undoubtedly being damaged to some extent by the flowing water just above it.

Below the Kinsey sand is a considerable thickness of loose shale in which it almost impossible to make an effective cementing job. These shales show oil at irregular intervals but no pronounced or continuous sand. One of the most persistent beds found is the tar sand just below these shales. It is logged in practically every well drilled to its depth and seldom fails to show up prominently. Attempts to produce this tar sand have universally failed. No production higher than 20 barrels of 10° (Baumé) gravity oil has been reported.

Immediately below the tar sand lies the "big flowing water" sand. This sand is coarse and the flow from it in early days was in some cases phenomenal. The tar sand and the "big flowing water" converge towards the axis of the anticline and there is evidence tending to show that they actually meet at least an one point. At this point a well encountered the tar sand but did not log the water sand. Attempts to produce from the tar sand finally brought water into the well presumably through the tar sand. This established the belief that the two sands had merged leaving the tar occupying the sand to the exclusion of the water.

Under the "big flowing" water there is about 50 feet of formation in which it is impossible to make a shut off, but solid formations occur below in which a shut-off is easily obtained.

The "gusher sands" which are more or less lenticular lie next below. It has been generally conceded by the operators that there are three of these sands but our work indicates a greater number.

The first of the "gusher sands" is generally called the "Wilhelm" sand. This sand was encountered in some of the earliest drilling. Midway Fields Oil Company Well No. 2 seems to have encountered it at a depth of 2982 feet but our records are fragmentary and do not show the overlying tar or flowing water sand, and consequently, our correlation can not be positive. Union Oil Company Jergins Well No. 1 evidently encountered the sand at from 3188 feet but did not get a good test on account of the failure of cement to set in cementing the 4½″ casing at 3182 feet. Union Oil Company International Well No. 2 was drilled just through this sand from 3140 feet to 3152 feet but did not get a positive test owing to complications above that point. The "Wilhelm" sand seems to have been quite generally produced from on Section 32, T. 12 N., R. 23 W., S. B. B. & M., and is reported to have received its name at a well of the Maricopa Star Oil Company on that section.

The data available to the State Mining Bureau indicates the presence of an oil sand about 60 to 70 feet below the "Wilhelm" sand throughout portions of the district. This sand, according to our correlations, is the one from which Well No. 1 of the Lakeview No. 2 Oil Co. produced while gushing, and from which International Well No. 4 of the Union Oil Company produces. In Union Oil Company International Well No. 5, it is logged as a water sand and the indications are that edge water is encroaching along it.

About 60 feet lower is a third sand which is generally called the "Trojan" sand from having been discovered in Trojan Well No. 1, Section 32, T. 12 N., R. 23 W., S. B. B. & M. According to the information in the files of the State Mining Bureau, this sand is being produced from in the following wells on Section 4, T. 11 N., R. 23 W., S. B. B. & M.: Union Oil Co. International Wells No. 3 and No. 5, Interstate

Oil Co. Wells No. 4 and No. 10, Lakeview No. 2 Oil Co. Wells No. 3 and No. 7, and it is recorded in the log of Union Oil Co. Jergins Well No. 1.

Several lower sands are recorded in Midway Fields Oil Company Well No. 3, and Well No. 4 of the Interstate Oil Company apparently gets its production from one of these.

It can be seen from the foregoing description that to produce from the gusher zone, and at the same time protect the shallow sands from both top water and the two intermediate waters, is a difficult problem. To have followed the accepted method of landing pipe above and below each water would have reduced the possibility of getting to the gusher sands because it would have required six strings of casing. Of these, the largest would throughout a large portion of the territory have to be from 2500 to 2800 feet in length.

Bearing in mind that some operators do not admit the existence of the top oil sand and that, even with the most careful drilling, it is difficult to locate definitely, the impracticability of continuing the policy of protecting all oil sands with casing is evident.

To meet the requirements of this particular locality Deputy Naramore suggested a method which is a modification of the mud-laden fluid method, and is outlined in the following letter, dated September 23, 1916, addressed to the State Oil and Gas Supervisor:

"The method of procedure approved by this department for the drilling of the International No. 5 well of the Union Oil Co. on Section 4, 11/23, is as follows:

"For ready reference we have divided the formations into zones, A, B, C, D, and E.

"After passing 2700 feet the company is to keep this office apprised of the log to ascertain if possible the exact depth of the top sand. This sand is listed as 'A'. The Union Oil Co. has failed to locate this sand in wells Nos. 2, 3 and 4. If located, it is to be thoroughly mudded before drilling further. It is expected somewhere between 2730 and 2750.

"The hole is then to be drilled through the first flowing water sand, 'B', expected between 2780 and 2850. The tools are to be stopped after passing through this water sand and the mud is to be circulated, then shut in at the top to force mud back into this water sand until the pumps are stalled at a high pressure, 700 pounds or more.

"Then drilling is to be resumed through zone 'C', and a careful watch kept for a showing of the 24° Be. sand between 2800 and 2900. This sand is recorded in Lakeview and Interstate 1, 2 and 3, and not in 4, 5, 6 and 7. It shows in old Coronation No. 1, but not in International 2, 3 and 4 on the same property.

"If found, this sand should be thoroughly mudded in same manner as described above for zone 'B'.

"Zone 'D', a tar sand, is logged as such in Lakeview Number Two wells Nos. 1, 3, 4 and 7 and in Union wells Nos. 2 and 3. If found, it should be mudded as above zones before cementing. With formations thus mudded up the very best possible results are to be expected with the cementing. In this job 600 sacks of cement are to be used which may reasonably be expected to raise a solid concrete plug high above the highest oil shows. This method will undoubtedly not only keep the water off of the oil but will prevent any migration of any fluid whatsoever, in all of the zones so treated. Moreover, in handling the sands in this sequence the oil sands are mudded before being exposed to the flowing waters.

"After the big cement plug is set and 'holed' through and tested by this department the hole is to be drilled through Zone 'E'.

"Zone 'E'. This is the second flowing water sand and is logged in Lakeview Number Two wells Nos. 1, 3, 4 and 7 and in Union wells Nos. 3 and 4.

"After drilling through this sand, which is expected between 3080 and 3120, it should be thoroughly mudded as above and then the second string of casing cemented at approximately 3150 feet. Enough cement should be used to insure its reaching up into the bottom of the first string, thus effecting a double shut-off.

"This method will thoroughly protect each formation, providing the work is carefully done at each stage and it will care for the water sands in exactly the same manner in which Mr. Stone, the drilling foreman for the Receiver, is using at the present time on wells on Section 32, as reported to me in recent conferences.

"There is much room for discussion on this problem but facts speak loudly when one reviews the wells that tried to use a separate string of casing for each sand. Lakeview Nos. 1 and 3 and Union Nos. 1 and 2 all have been monuments of expense and are still incomplete or abandoned."

This brought about considerable discussion by the operators who finally submitted written opinions on the subject to the Bureau. In answer to these, the State Supervisor ruled as follows under date of November 28, 1916.

"It seems desirable that a definite policy be established with reference to drilling new wells in the Maricopa Flat so as to uniformly protect the various sands from water.

"I have your letter of November 2d covering this subject as it was discussed at a meeting of operators. I have also read the summary of their arguments as given in a circular letter by Mr. F. B. Tough, of the K. T. & O. Co. Letter of Mr. C. H. White of Lakeview No. 2 Oil Co., dated November 21st, has also been carefully considered on account of its clear statement of reasons for and against the method proposed. Letter of A. J. Pollak of the Miocene Oil Co., dated November 23d, is at hand but is merely an expression of opinion, without reasons or references.

"In view of the above discussions and our own observation in that vicinity, the following plans should hereafter be followed:

"Where the distance from the top oil sand to the one which it is proposed to produce from is not more than 400 feet.

"1. Set a string of 10″ casing above the top oil sand at a depth specified by this department, cement, and test as usual.

"2. Carry 8″ casing through various oil and water sands, using mud under pressure to shut off each sand as encountered, land the casing above the oil sand from which it is proposed to produce, at a depth specified by this department, and put in enough cement to cover all sands encountered below the 10″ casing. The work of placing this cement must be witnessed by a representative of this department. The shut-off must be tested in the usual manner.

"When the distance from the top oil sand to the sand from which it is proposed to produce is more than 400 feet, the following plan should be followed:

"1. Land a string of casing, 12½″ or larger, at a depth of 400 to 800 feet, or in other words, below the loose formations found comparatively near the surface. This string of casing, serving as a conductor, should be cemented.

"2. Set a string of 10″ casing below the top oil sand, at a depth specified by this department, less than 400 feet above the point where the next smaller string of casing is to be landed. The 10″ casing must be so handled as to force mud, under pressure, into each sand as it is encountered and enough cement must be put back of the casing to cover all sands up to and including the top oil sand. This cementing must be witnessed by a representative of this department and the usual test of shut-off must also be made.

"3. Carry 8″ casing through the various oil and water sands, using mud under pressure to shut off each sand as encountered, land the casing above the oil sand from which it is proposed to produce, at a depth specified by this department, and put in enough cement to cover all sands encountered below the 10″ casing. The work of placing this cement must be witnessed by a representative of this department, and the shut-off must be tested in the usual manner.

"You will please be guided by the foregoing rules in all your decisions in that vicinity. These rules will not be altered unless definite facts and results as to mechanical operations are formally presented to this department in such form as to show an improvement."

It has been found that Method No. 1, which requires a shut-off above the top oil, is the most satisfactory in this district for two reasons:

First. It enables the operator to definitely locate the top sand, which in turn gives him valuable information on where to expect the underlying formations.

Second. It brings the points of shut-off in formations in which it is possible in nearly every case to secure a satisfactory shut-off.

BELRIDGE FIELD.

Mr. Bush, while at the Taft office, did some more or less detailed work in the Belridge District. It was thought at that time that a contour map of the oil sands would be of value, and to that end an effort was made to so correlate the sands as to furnish the necessary data. Owing to peculiar conditions existing there, this was found to be impossible, but it was finally found possible to contour the top of the brown shale with very good results.

The work done in that field shows that the shallow oil lies above the brown shale in a number of sands which are separated by blue shales. It also shows that these sands and blue shales lie unconformably on the brown shale, and that the contact surface is roughly anticlinal in form. This should not be construed to mean that we have exact knowledge as to the dip and strike of the individual beds of the brown shale, for we have not. The overlying sands and blue shales form a broad flat anticline over this irregular ridge of brown shale, but only the upper sands are continuous.

An interesting feature, probably the direct result of this condition, is that the gravity of the oil produced is controlled roughly by the proximity of the oil sand to the brown shale. Those sands immediately on the brown shale carry oil as high as 33 degrees Baumé gravity, and from this the gravity ranges to 14 degrees and lower, with distance from the shale.

WATER CONDITIONS.

''Top'' water is present on the flanks of the anticline and probably in small quantities near the apex. This water is easily controlled.

The most serious water condition is that due to the occurrence of water in the outer edge of the field, which is either from an ''edge water'' condition in the lower portions of producing sands, or from lenticular beds of water sand. This condition has only recently been discovered, and it is being met promptly by the operators as it develops. In handling this, mud and cement are used behind the pipe to seal off all oil strata through which the pipe passes, in case it is desired to produce below the sand carrying the water. Wherever a satisfactory production can be won from above such a sand, the practice is merely to treat it as "bottom water" and finish the well above it.

LOST HILLS FIELD.

Owing to the great distance from Taft, it has been impossible to give this field the detailed attention it deserves. Our work has been principally that of keeping in touch with the operations of a few active companies.

The structure of the field is that of an anticline, plunging to the southeast. The southeast end of the field is the most completely developed and has been previously described in various publications. Recent development has been towards the northwest, where, owing to the plunge, the productive formations are found at comparatively shallow depths.

Over a large area in the northwestern portion of the field it has been found possible on account of the plunge having eliminated the top water sands, that are found to the southeast, to produce clean oil from shallow sands with the use of only one string of pipe. In this area some rapid development has taken place, mainly, if not entirely, on the northeast flank of the fold.

In the territory positively known to be on the northeast dip no serious water trouble has developed. Along a narrow strip at the southwest edge of the developed area a shallow water-bearing sand has been encountered. Fortunately, a fair production can be won from the sands overlying the one affected and the practice now is to finish the wells above it or, in the case of older wells, to plug back and rely on the upper sands for production.

The information available to the State Mining Bureau does not show conclusively the structural condition to which this occurrence of shallow water is due. It has been quite generally conceded that this water occurs only on the southwest flank of the anticline and as an "edge water." There is, however, some reason to believe that the axis of the anticline may lie farther to the southwest than was generally supposed, and that the water may be the deeper water stratum known towards the northeast, brought up by a sudden steepening of the dip of the beds as the axis of the anticline is approached. Should this latter prove the correct explanation, there would seem to be a possibility of the existence of a separate productive area not yet developed on the southwest limb of the anticline.

KERN RIVER FIELD.

The largest area in which we have had a working knowledge of the structure is the Kern River Field. This has been due to the simplicity of the underground conditions rather than to our having done any great amount of detail work.

The field lies in the southwestern limb of a broad anticlinal spur, which seems to branch out from the Sierra Nevada foothills along the mouth of the Kern River Canyon. So far as our work is concerned, the field may be considered a monocline with a gentle dip to the southwest. The dip varies only slightly in different portions of the field. In the southwest quarter of Section 33, T. 28 S., R 28 E., M. D. B. & M., the dip has been determined to be approximately 6.5 feet per 100, to the southwest. One mile south from Section 4, T. 29 S., R. 28 E., it has been determined to be about 7.5 feet per 100, south 50° west. In Section 5, T. 29 S., R. 28 E., the west component of the dip has been determined to be 6.1 feet per 100; the south component, and consequently the true direction and angle of the dip, has not been exactly determined. Further work to the west may show a steepening of the dip and possibly a change in the strike to a direction more nearly north and south.

The logs of the field show a general similarity, but no continuous marker has as yet been found that can be used as a guide in correlating. One "rule of thumb" by which the point of shut-off has been determined in much of the drilling is that it should be made below the second tar sand. Had this been uniformly followed, the field would undoubtedly have been in much better condition than it is today. Judging from the logs it would appear that the sands and clays are lenticular. This we know to be true to a certain extent, and yet we believe that had the logs been more accurately kept, considerable regularity of beds would be shown.

Throughout the most of the field "top water" is found in abundance but under low head. Owing to the low head on this water, there are portions of the field to which it does not reach and in which wells can be made to produce clean oil with only one string of pipe. Such territory is limited, however, to the higher portions of the monocline, in the extreme northeast edge of the field.

So far as our work has gone, it has not shown any marked structural changes that would be expected to limit the productive area. To the south and west it appears that the drilling has reached a point where water occupies certain sands that higher up carry oil. This condition can neither be proven nor disproven until the irregularity of "shut-offs" in many edge wells is corrected.

There are theories that the water menacing the production of the field is all top water, and theories that it is all bottom water, and there are some convincing arguments on both sides. It is argued that the fact that certain deep wells, now known to have water in the bottom sands, originally produced clean oil, proves that the water has been let into the sands from above. This is possible, but it neglects the possibility of encroaching ''edge water.''

On the other hand, it is argued that if the water were coming from the top sands, with the great number of wells with leaking water strings and abandoned wells with no pipe left, and the offsetting wells with water strings landed hundreds of feet stratigraphically nonuniform, there would be nothing but water produced in the field.

This Department has not gone extensively into these theories. It has been content to know that when the deep wells are plugged in every clay or shale stratum from the original bottom back until the well ceases to produce water, the value of the well to the owner has been increased many fold and that the possibility of the well being a source of damage has been eliminated.

Similarly, when it has been believed by the operator that it was necessary, in order to shut water out of the production, to land the water string below sands that were known to carry clean oil in other parts of the field, the Department has ruled that all sands below the point of uniform shut-off should be mudded thoroughly and cemented by forcing sufficient cement behind the water string to reach top sand so mudded.

By these means we are reasonably certain that the water will be confined to its present strata, and if the offending wells are ever so treated, it can be confined to its original strata, except in the case of an encroaching ''edge water.''

In following out this policy, we would like to see the unplugged abandoned wells treated first. Unfortunately, they will probably be the last ones to be repaired, and we expect that much work will be done that might not have been necessary had the original offenders been taken care of first. However, the uncertainty of finding the original offenders, together with the certainty of getting the cost of the work back out of any well in which water is shut off, we think justifies our policy.

Another policy that might be mentioned is that of plugging the relatively few bottom-water wells before undertaking the correlation of the trouble due to nonuniformity of ''shut-off.'' This is merely to eliminate the smallest class of trouble makers, in order to simplify the proposition of finding and correcting the others.

The correlation of nonuniform ''shut-offs'' is a matter that will call for more and more attention as time goes on. At present, the most promising method is that of spudding down alongside the old well to the proper point of ''shut-off'' and thoroughly mudding the formations at that point.

COMPLAINTS.

SUNSET MONARCH OIL COMPANY, Sec. 26, T. 12 N., R. 24 W., S. B. B. & M.
vs.
AMERICAN OILFIELDS COMPANY, Sec. 32, T. 32 S., R. 24 E., M. D. B. & M.

This complaint was formally initiated on October 9, 1915, and at one time reached the stage where work was commenced on Well No. 5 of the American Oilfields Company by that company.

On November 22, 1915, the Superintendent of the company reported on this work in part as follows:

> "In going into the well we were able to get to 1700′ with a little cleaning out, and at this depth we went outside of the 6⅝ casing, showing that it has a hole in it at that depth. The casing seeming to be bad at some distance above this depth, I had the hole filled up, and in going down I went through the casing again at 1667′, which goes to show that it is useless to attempt anything further with the 6⅝ casing that is in the hole at the present time, as the oil sand, which I believe the Sunset Monarch people desire to have protected, is at 2250′. I also used a Jar Down Spear for the purpose of getting vibration, and found some vibration on the top of the casing at 1580′, which looks as though there is a possibility of getting the 6⅝ casing out, down that far.
>
> "I have laid off the crews that I had working on the well until the matter has been gone over, and some conclusion arrived at, as to what the Sunset Monarch would like to have done. In going out through the casing at the depth where I found we actually did go out, it is going to mean the drilling of a new hole down to the point of cementing, and in cases of this kind there is always the possibility of the new hole which we drill, by the time we reach the depth where we would like to cement, being some distance from where the old original hole is located; and to get these two holes properly connected, get the old pipe out of the way that is in them, and cement them off to prevent water from getting into the lower sands, is the problem now to be taken into consideration, which I would like to have you do and advise me as to any conclusions that either yourself, or the Sunset Monarch may reach."

This left the well in bad condition and threw the burden of laying out plans for the correction of the trouble on to the State Mining Bureau. After a preliminary canvass of the situation, it was found that the information furnished by the two companies was not sufficiently complete nor accurate to warrant basing recommendations on it. Some difficulty was experienced in getting the added information necessary and the official logs of the Sunset Monarch wells were not received until December, 1916. A cross section was then made which showed such a complex situation that it was decided to construct a peg model and go into the matter more thoroughly.

On January 22, 1916, letters were written to both companies, asking for histories of the wells in question, and for the production records. The information thus elicited was very meagre.

To complete the peg model it was necessary for the Department to correct the elevations that had been submitted. The work had been completed and a report started when the Sunset Monarch property was taken over by the Standard Oil Company.

A comparison of data with the geological department of the Standard Oil Company developed some differences of opinion as to the extent of a certain water sand indicated on the peg model. By mutual agreement the report was held up pending the result of the drilling contemplated by the new owners. This drilling has furnished some valuable information, and it is now expected that when this is put in proper form it will enable us to make a complete report outlining the work necessary to correct existing conditions.

TRADERS OIL COMPANY, Sec. 23, T. 32 S., R. 23 E., M. D. B. & M.
vs.
INDIAN & COLONIAL DEVELOPMENT COMPANY, Sec. 22, T. 32 S., R. 23 E., M. D. B. & M.

Since reporting on this in Bulletin No. 73, the Department has made an extensive investigation of the water trouble complained of. Very little trouble was experienced in getting the necessary data, and our requests for logs and histories and detailed production reports were promptly complied with by the operators.

A peg model was constructed which served the purpose of eliminating from consideration a large number of wells and narrowing the investigation down to those most likely to be offenders.

On December 28, 1916, the writer reported to the State Oil and Gas Supervisor in part as follows:

"The scope of the examination can be materially enlarged when the logs of the Knob Hill, Kern Crown, Palmer Union, Cheney Stimson, and Burks Wells, in Section 23 become available. Without these I doubt if the trouble can be wholly corrected.

"A good start can be made, however, by beginning on the wells that are known to be in bad shape. First among these, I will put Indian Colonial No. 11, Section 23, T. 32 S., R. 23 E., M. D. B. & M. This well was drilled in 1907, and our log of it shows both top and bottom water. As for the top water, the preponderance of evidence is against its presence in this vicinity.

"There is no record of any attempt having been made to plug off the bottom water and the presumption is that this water has access to the oil sands. I am of the opinion that this well is the source of much of the water which has appeared in a number of wells higher up the dip. Many of these produced clean oil for periods ranging from a month to several years before showing water. Such a condition over a limited area might easily be caused by a bad well. However, it is not likely that this well is furnishing all the water appearing in the district affected.

"The general appearance of the whole situation would rather suggest an 'edge water' condition in one or more of the sands. Were it not for the fact that there are a number of other wells in the district which our records show to be at fault, I would unhesitatingly call it an 'edge water' condition. But even so, it is imperative that all bad wells be repaired before proper measures can be taken to correct such a condition. Furthermore, just such a condition could be produced by several bad wells properly located, and there is no means of telling how much of this trouble is due to bad wells, until they are corrected.

"Another well which appears from our log to be in bad shape is Buena Fe Petroleum Company (Mountain Girl) No. 17, Section 22. The casing has been pulled and there is no report of any attempt to plug off the bottom water.

"Buena Fe (West 40) No. 3 is another well in which bottom water was encountered. Its log makes no mention of any attempt to plug it.

"In addition to these, I find a number of wells that have been plugged by bridging above the water sand. Such plugging has in a number of cases shut the water out of the producing part of the well, but has left it free of access to other sands than the one in which it originally occurred. Among these are: Buena Fe Pet. Co. (Bay City) No. 3, presumably with open hole, from 910 to 975 feet; Buena Fe Pet. Co. (Mountain Girl) No. 13, with 68 feet of open hole below the plug; Indian Colonial Dev. Co. No. 4, plugged at 1316, 1280 and 1125 feet with no record of formation between these plugs. Any of these wells may be contributing to the seeming 'edge water' condition throughout this district.

"A number of other wells are reported in good shape but deserve mention merely to give a history of the trouble:

Indian Colonial Dev. Co. No. 1, drilled in 1908, entered bottom water. This was plugged off and the well produced clean oil for one year, when water broke in again. Attempts to plug off this water indicate that this water came in about 300 feet higher in the formation than the first bottom water;

"Wilbert No. 2, drilled in 1909, and encountered water at about this same place. This was about the same time the upper water broke into Indian Colonial No. 1;

"Wilbert No. 1, drilled during the same year, produced clean oil for three months before showing water. By July, 1911, both Wilbert wells were suspended on account of this water.

"I am of the opinion that the water in these three wells comes from Indian Colonial No. 11, Section 23. The continuous pumping of Indian Colonial No. 1 would be expected to draw the water towards it. Wilbert No. 2 would be expected to find the sand flooded, as it is near Indian Colonial No. 1. The position of Wilbert No. 1 relative to the other three wells, would lend weight to the supposition that the water was drawn to it as a result of its own production. It is possible that dye put in Indian Colonial No. 11 would show conclusively whether any of this water comes from that well. This may be impossible on account of the casing being choked with litter.

"Another preliminary test that might be made is to determine the fluid levels in General Petroleum No. 1, Section 27, T. 32 S., R. 23 E., M. D. B. & M. This well does not report water, but is quite deep and undoubtedly has it. It is not likely that it stands high enough to reach the oil sands as the well is quite near the outcrop. If the mechanical condition of the well permits the determination of the fluid level this point can easily be settled.

"I would advise putting this matter before the various agents of the companies concerned and getting their suggestions and any further facts that they have neglected to give us. If this does not bring out any facts contradicting the records that we have of these wells, I would advise repair work on the following wells:

"Indian Colonial Dev. Co., No. 11, Sec. 23, T. 32 S., R. 23 E., M. D. B. & M.

"Indian Colonial Dev. Co., No. 4, Sec. 22, T. 32 S., R. 23 E., M. D. B & M.

"Buena Fe Pet. Co. (Mountain Girl), No. 17, Sec. 22, T. 32 S., R. 23 E., M. D. B. & M.

"Buena Fe Pet. Co. (West 40), No. 3, Sec. 22, T. 32 S., R. 23 E., M. D. B. & M.

"Buena Fe Pet. Co. (Mountain Girl), No. 13, Sec. 22, T. 32 S., R. 23 E., M. D. B. & M.

"When these wells are put in proper shape, conditions can be watched for a time, and no doubt improvement will result. It is of course possible that natural 'edge water' is encroaching throughout the district, and if so, there will be no doubt of it after these offending wells are repaired.

"A more strenuous repair campaign will be demanded if the trouble proves to be 'edge water', but no recommendations can be made as to this work until the repair work on the wells mentioned is completed and results noted."

The condition of the wells mentioned was brought to the attention of the operators by the State Oil and Gas Supervisor in letter dated January 3, 1917. Mr. L. P. Guiberson, General Manager of the Indian & Colonial Development Company, immediately expressed a willingness to undertake the repair of his company's Well No. 11, and by April 30th a new rig had been built over the well and work well started.

The Buena Fe Petroleum Company and the General Petroleum Corporation furnished additional information on the condition of some of their wells. This information has eliminated certain of the wells as possible sources of trouble. The water level in General Petroleum Corporation Well No. 1, Section 27, T. 32 S., R. 23 E., M. D. B. & M., was reported as being below the oil sands which this investigation is attempting to protect.

The reported work on Buena Fe Petroleum Company (Bay City No. 3), indicated that it was still a possible source of water, but tests made by the company since that time have shown conclusively that the well has not been damaging the producing sands.

The information furnished concerning Buena Fe Petroleum Company (Mountain Girl) No. 13 and No. 17, indicates that both may be in need of repair.

The results of the repair of Well No. 11 of the Indian & Colonial Development Company will determine to a large extent the other work that will be necessary. The work on this well was suspended for some time and it finally became necessary for the State Oil and Gas Supervisor to issue the following formal Order directing that the work be done.

ORDER NUMBER THREE,
BY
STATE OIL AND GAS SUPERVISOR R. P. McLAUGHLIN,
Dated September 18, 1917,
RELATIVE TO
INDIAN COLONIAL DEVELOPMENT COMPANY, WELL No. 11,
Section 23, T. 32 S., R. 23 E., M. D. B. & M.

"To *Indian Colonial Development Company,*
L. P. Guiberson, its Attorney in Fact,
Producers Guaranteed Oil Company.

It appearing to the supervisor that water in excessive and damaging quantities is at present entering the oil sands of several wells situated within a radius of approximately one-half mile from the quarter section corner common to Sections twenty-two (22) and twenty-three (23), Township thirty-two (32) South, Range twenty-three (23) East, M. D. B. & M., in Kern County, California; and

It further appearing that several oil operators and owners of property situated within said region have filed written complaint of said condition with the supervisor, said supervisor has caused an investigation to be made pursuant to Section 8, Chapter 718, Statutes of 1915, amended 1917, and has determined that the following conditions exist:

The excessive amount of water is probably due to improper conditions existing at more than one well in the vicinity. It will probably be necessary to repair various wells in order to stop the damage. It appears inadvisable to begin widespread repairs on all wells, but rather to first repair such wells as are clearly maintained in such condition as to afford access of water into the oil sands. After such repairs are made, and the results noted, the other wells may be treated as circumstances may indicate.

The log of Well Number Eleven (11) of the Indian Colonial Development Company, situated in the Southwest Quarter of the Southwest Quarter of the Northwest Quarter of Section Twenty-three (23) Township thirty-two (32) South, Range twenty-three (23) East, has been filed with the supervisor by L. P. Guiberson, signing himself as general manager for said company. The log shows the well to have been drilled to a depth of approximately one thousand five hundred and sixty-six (1566) feet.

The rig was subsequently removed and well has not been pumped for a long period of time. The aforementioned information indicates that water was encountered in the vicinity of and below oil sands known to be productive in neighboring wells. There is no evidence before the supervisor showing that proper plugs were placed in the well in such position as to prevent the flow of such water as was encountered from entering said productive oil sands. It is probable that such flow of water is entering said oil sands.

The condition of said well, as aforementioned, was brought to the attention of L. P. Guiberson, general manager of the Indian Colonial Development Company, by the State Oil and Gas Supervisor in a letter dated January 3, 1917. Said letter further requested that repair work be commenced on the well pursuant to specifications to be furnished by Deputy Supervisor R. N. Ferguson. About January 6, 1917, said general manager called at the office of said deputy supervisor at Taft and signified a willingness to commence said repair work. Under date of February 19, 1917, said general manager wrote to the supervisor stating that a rig had been erected at the well and that certain other work, preparatory to repairing the well, had been completed. The letter further stated that actual repair work would be commenced as soon as possible.

On April 30, 1917, said general manager reported to said deputy supervisor that a depth of seven hundred and fifty (750) feet in the well had been reached with a ten (10) inch bit. Said depth is below the bottom of the ten (10) inch casing, as shown by the log of the well. This indicated that some eight (8) inch casing had been withdrawn from the well.

On May 8, 1917, said general manager reported to said deputy supervisor that a depth of one thousand one hundred (1100)) feet had been reached in the well; that the top of eight and a quarter (8¼) inch casing was found at a depth of eight hundred and thirty-six (836) feet and that the eight and a quarter (8¼) inch casing was swedged open and found in good condition.

Further progress has not been reported to the supervisor.

On August 13, 1917, the supervisor addressed a letter to said general manager, calling attention to reported cessation of work, and suggesting the advisability of presenting a definite showing why a formal order should not be issued.

The foregoing statements show the reason and necessity of repair work at Indian Colonial Well Number Eleven (11), Section twenty-three (23), Township thirty-two (32) South, Range twenty-three (23) East, M. D. B. & M.

The foregoing statements also indicate that repair work has not been diligently pursued by the Indian Colonial Development Company, the operators of said well, notwithstanding the written statements of its general manager that such work would be diligently pursued.

Now, therefore, pursuant to Sections 8 and 11, Chapter 718, Statutes of 1915, amended 1917, it is hereby ordered that the following work be immediately commenced and operations carried on continuously until completion:

First: Redrill or clean out the well to a depth of one thousand five hundred sixty-six (1566) feet, or until it is demonstrated that the original bottom of the well has been reached. If it proves necessary, in order to reach said original bottom of well, mud shall be used between the depths of one thousand three hundred seventeen (1317) feet and said original bottom of well.

Second: The hole shall be solidly plugged and tamped with clay from the original bottom to a depth of one thousand four hundred forty-nine (1449) feet.

Third: From the top of the last mentioned clay plug the well shall be shot with fifty (50) pounds of sixty (60) per cent dynamite and cleaned out to top of said clay plug. Sufficient cement shall then be placed in the hole to fill it to a depth of one thousand four hundred ten (1410) feet.

Fourth: After it is demonstrated that the last mentioned cement plug has been properly set at the specified depth, the hole shall be solidly plugged and tamped with clay from the top of said cement plug up to a depth of one thousand three hundred seventeen (1317) feet.

Fifth: From the top of the last mentioned clay plug the well shall be shot with fifty (50) pounds of sixty (60) per cent dynamite and cleaned out to top of said clay plug. Sufficient cement shall then be placed in the hole to fill it to a depth of one thousand two hundred sixty-one (1261) feet.

Sixth: After it is demonstrated that the last mentioned cement plug has properly set at the specified depth, the well shall be tested by bailing.

All work must be done to the satisfaction of the supervisor.

All demonstrations of required plugging shall be witnessed by the supervisor or his duly appointed representative.

A written report shall be furnished to the supervisor each day by the owner or operator of the well. Said report shall be in duplicate, signed by the representative of the owner or operator of the well, and shall fully and completely set forth all work accomplished during the preceding twenty-four hours, together with the names of all workmen employed at the well within said period of time.

Deputy Supervisor R. N. Ferguson of Taft, California, is hereby appointed to represent the supervisor in so far as it may be necessary to inspect the work and receive reports of same.

Any and all requests for modification of the aforementioned specifications must be made in writing, addressed to the supervisor and delivered to said deputy supervisor. Said deputy shall thereupon forward said request or requests to the supervisor, together with such recommendations as may be deemed necessary."

At the present writing, December 11, 1917, the well is cleaned out to original bottom and the work of plugging will soon be under way. On account of new information, developed in the course of the redrilling some changes have since been made in the specifications contained in the order.

KERN TRADING AND OIL COMPANY, Sec. 30, T. 12 N., R. 23 W., S. B. B. & M.

vs.

NATIONAL PACIFIC OIL COMPANY, Sec. 30, T. 12 N., R. 23 W., S. B. B. & M.

November 17, 1915.

There have been no new developments in this case during the past year, but a better feeling prevails and it is thought likely that work will be started voluntarily during the coming year.

ROCK OIL COMPANY, Sec. 23, T. 31 S., R. 22 E., M. D. B. & M.
vs.
SAN FRANCISCO MIDWAY OIL COMPANY, Sec. 24, T. 31 S., R. 22 E., M. D. B. & M.

January 21, 1916.

Extreme difficulty was experienced in getting information on which to base this investigation. This was true of the plaintiff company as well as the defendant. Cross sections were made which indicated that several wells were at fault. A preliminary report to the State Oil and Gas Supervisor, dated December 20, 1916, recommended that work be started on two of the wells at once.

It was recommended that top water be excluded from Well No. 2 of the San Francisco Midway Oil Company, and that a test of the old job of plugging for bottom water be made. The top water had been let into the well by perforating the water string.

A test of the water string of Rock Oil Company No. 2 was also recommended. Other work was made dependent upon the results of this work. A further investigation was made later under the direction of Deputy M. J. Kirwan, which resulted in the issuance of a more complete set of specifications for the repair of the San Francisco Midway Oil Company wells.

On May 25, 1917, the department witnessed a bailing test on Well No. 2 of the San Francisco Midway Oil Co., which demonstrated that the old job of plugging had successfully shut bottom water out of producing formations. The test was made after top water had been excluded by means of a packer set below the perforations of the 8¼″ water string. The department then authorized plugging the well up to the shoe of the 8¼″ casing and redrilling to make a higher "shut-off," in order to test the oil showings previously cased off behind the water string. This work has not been completed, and as the results may determine in a measure the work that will be required on other wells, the completion of the investigation is awaiting these results.

In securing information for further investigation of this complaint, it was found necessary to issue the following formal order:

ORDER NUMBER TWO
BY
STATE OIL AND GAS SUPERVISOR R. P. McLAUGHLIN,
DATED JULY 2, 1917,
RELATIVE TO
SAN FRANCISCO MIDWAY OIL COMPANY WELL No. 2.
Section 24, T. 31 S., Range 22 E., M. D. B. & M.

"To *Rock Oil Company,*
San Francisco Midway Oil Company,
Brookshire Oil Company,
Midland Oilfields Company,
General Petroleum Corporation:

It appearing to the supervisor that written complaints signed by more than one-third of the individuals or corporations owning land, or operating wells, within a radius of one mile of a certain well known and designated as San Francisco Midway Well No. 2, situated in the southwest quarter of the southwest quarter of section 24, T. 31 S., R. 22 E., M. D. B. & M., have been filed pursuant to Section 11, Chapter 718, Statutes of 1915, said supervisor has caused an investigation to be made and has determined that the following condition exists:

Water in excessive and damaging quantities is at present entering the oil sands of several wells within a radius of approximately one-fourth of a mile from the said well.

The excessive amount of water is probably due to improper conditions existing at more than one well in the area mentioned. Relief can only be had by treating all the wells under a single comprehensive plan, for the reason that they are intimately related underground.

The investigation began with the assumption that the damaging conditions complained of originated in and were local to the said well. The owners of said well have performed certain work upon it, with the advice and suggestions of the supervisor. Considerable vital information as to the condition and productiveness of various neighboring wells is not shown by records filed with the supervisor. Failure of the Rock Oil Company, the original complainant, to fully cooperate with informal requests for information, relative to fluid levels and production, has been particularly notable.

It is necessary to perform certain tests in order to more definitely determine the source of the infiltrating water and direct repair work at the wells for the purpose of preventing damage.

Now, therefore, pursuant to sections 8 and 11, Chapter 718, Statutes of 1915, it is hereby ordered that the following tests be made and the following records furnished:

Measurements of amounts of oil and of water must be made at the following wells:

Rock Oil Company wells numbered One (1), Two (2), Three (3), Four (4), Seven (7), and Eight (8) in Section 23.

San Francisco Midway Oil Company wells numbered Two (2), and Three (3) in Section 24.

General Petroleum Corporation well numbered Four (4) "Brunswick" in Section 26.

Midland Oilfields Company wells numbered One (1), and Two (2) in Section 25.

Brookshire Oil Company well numbered Five (5) in Section 24, all in Township 31 South, Range 22 East, M. D. B. & M.

The measurements are to be made at each well separately at least three times for periods of twenty-four hours each. Measurements are to be made within ten days from date hereof and a written statement of the results of all measurements must be filed with Deputy Supervisor R. N. Ferguson, at Taft, California, within fifteen days from date hereof.

The measurement of amounts of oil and of water are to be made by running all fluid from the well into a tank of sufficient capacity to contain all fluid produced in twenty-four hours. Flow into the tank must be maintained continuously for twenty-four hours unless it amounts to more than fifty barrels in which case a shorter period of time will be permissible. At the end of the prescribed period of time, flow into the tank is to be stopped and the total fluid measured. Such free water as may have settled to the bottom of the tank shall be drawn off and the remaining fluid again measured and sampled to determine the amount of water held in suspension, as shown by proper test with centrifuge. Details of the manner of making measurements and submitting statement of results thereof to be subject to the approval of Deputy Supervisor R. N. Ferguson.

Measurements to determine the depths at which fluid stands must be made within thirty days from date hereof at each of the following wells:

Rock Oil Company wells numbered One (1), Two (2), Three (3), Four (4), Seven (7), and Eight (8) in Section 23.

General Petroleum Corporation well numbered Four (4) "Brunswick" in Section 26.

Brookshire Oil Company well numbered Five (5) in Section 24.

Midland Oilfields Company wells numbered One (1), and Two (2), in Section 25.

San Francisco Midway Oil Company well numbered Three (3) in Section 24, all in Township 31 South, Range 22 East, M. D. B. & M. The tests to determine the depth at which fluid stands are to be made by withdrawing the tubing from the well, and, after ten hours from the time the tubing is removed, measuring to the surface of the fluid, measurement to be witnessed by Deputy Supervisor R. N. Ferguson, or a person designated by him for that purpose.

Tests must be made at Rock Oil Company well numbered Two (2) to determine whether or not the eight and one-quarter inch (8¼″) casing is leaking water and also whether or not the water shut-off at the bottom of said casing is effective. Manner and date of these casing tests to be subject to written request by Deputy Supervisor R. N. Ferguson.

Complete written records must be furnished within thirty days from date hereof to Deputy Supervisor R. N. Ferguson at Taft, California, for the following specified wells and operations:

Rock Oil Company well number Five (5), method of abandonment; well numbered Two (2), redrilling; both in Section 23.

Midland Oilfields Company wells numbered One (1), and Two (2), in Section 25, record of drilling, all in Township 31 South, Range 22 East, M. D. B. & M.

Further tests and repairs will be determined after completion of the aforementioned tests and measurements and will be covered by a supplement, or continuation of this order."

The tests and information demanded in the order have been made or furnished with the following exceptions:

Rock Oil Co. Well No. 3, not tested on account of lost tubing and rods in the hole.

San Francisco Midway Oil Co. Wells No. 2 and No. 3 not tested.

At the present writing, December, 1917, it appears likely that the more stringent provision of the law will have to be invoked to secure compliance with the order.

PACIFIC CRUDE OIL COMPANY, Sec. 32, T. 31 S., R. 23 E., M. D. B. & M.
vs.
BUICK OIL COMPANY, Sec. 32, T. 31 S., R. 23 E., M. D. B. & M.

No progress has since been made.

NACIREMA OIL COMPANY (Now Pittsburg Oil & Gas Co.)
Sec. 6, T. 30 S., R. 22 E., M. D. B. & M.
vs.
UNITED STATES OIL & MINING COMPANY (Now Nevada County Oil Co.),
Sec. 6, T. 30 S., R. 22 E., M. D. B. & M.

While it has been impossible for the department to secure sufficient definite information on which to base recommendations, the normal development of the territory has virtually eliminated the trouble complained of. The Nevada County Oil Company has been diligently prosecuting the work on the wells complained of and approval has been granted by this department to abandon Well No. 4 (now No. 44) and to redrill Well No. 3 (now No. 43).

We have had no application as yet to work on Well No. 2.

FAIRBANKS OIL COMPANY, Sec. 22, T. 32 S., R. 23 E., M. D. B. & M.
vs.
GENERAL PETROLEUM CORPORATION (Sibyl), Sec. 22, T. 32 S., R. 23 E., M. D. B. & M.

February 25, 1916.

The investigation of this matter was held in abeyance during the tests conducted under Complaint of Fairbanks Oil Company *vs.* Buena Fe Petroleum Co., but in view of the fact that the well tested in that case was shown not to be at fault, it is likely that a further examination into the condition of the Sibyl well will be requested by the Fairbanks Oil Company.

FAIRBANKS OIL COMPANY, Sec. 22, T. 32 S., R. 23 E., M. D. B. & M.
vs.
BUENA FE PETROLEUM CO., Sec. 22, T. 32 S., R. 23 E., M. D. B. & M.

March 7, 1917 (Verbal).

This matter did not reach the stage of a complaint, but as it resulted in the testing of a well which previously appeared to be improperly plugged, it has been so classed for record.

Representatives of the two companies met at the Taft office of the State Mining Bureau on August 15, 1917, and an agreement was reached, to the effect that the Buena Fe Petroleum Co., Ltd., would clean out its Well No. 3 (West 40) to a depth of 1050 feet and make tests of the old plugging between that depth and the bottom water which had been encountered in drilling the well. All the records concerning this old job of plugging showed that the water had not been shut off until the final cementing, which brought the top of the plug up to a depth of 961′, or 42′ inside the unperforated 8¼″ casing. In testing this well, the hole was cleaned out to a depth of 1042 feet and showed only a slow rise of water level after bailing. It was then plugged back to 999′, after which an 8¼″ perforated liner was set in and the 10″ casing perforated from 710′ to 720′.

A pumping test was made on November 27, 1917, with the pump set at a depth of 966′, and after standing 19 hours the well pumped but three barrels of fluid before exhausting the same. This test showed clearly that the well had not been the source of the water complained of.

In making the test, the company was able to salvage the 8¼″ casing.

HALE-McLEOD OIL COMPANY and MIDWAY FIVE OIL COMPANY,
Sec. 2, T. 32 S., R. 23 E., M. D. B. & M.

vs.

KALISPELL MIDWAY OIL COMPANY, Sec. 5, T. 32 S., R. 23 E., M. D. B. & M.
March 30, 1916.

Mr. Naramore's work on this complaint, as reported in Bulletin No. 73, showed the troubles complained of to be very complex. Lack of complete records and shortage of time have rendered it impossible for the department to make as extensive an investigation as the conditions warrant.

The abandonment by the Kalispell Midway Oil Company of the well complained of (No. 2), relieved the situation temporarily. The plugging of this well was specified by this department and should prevent the well from being a menace in the future. From the data available at the time of its abandonment, it appeared that the well was getting the water through an oil sand, probably as a result of neighboring wells having had their water strings landed below this sand.

MIDWAY ROYAL PETROLEUM COMPANY, Sec. 19, T. 31 E., R. 23 E., M. D. B. & M.

vs.

BROOKSHIRE OIL COMPANY, Sec. 24, T. 31 S., R. 22 E., M. D. B. & M.
April 3, 1916.

At the urgent request of the Midway Royal Petroleum Company this matter was again gone into. A complete set of production reports of the various wells was secured and plotted, and in order to make this information of value, the two companies were requested to pull the tubing from the wells in question and allow us to determine fluid levels and depths of the various holes.

The Brookshire Oil Company furnished the department the opportunity asked for, at once, and the wells made a very creditable showing.

The Midway Royal Petroleum Company, at whose request the investigation was undertaken on June 14, 1917, failed to furnish the department with an opportunity to make the corresponding measurements on its wells and, consequently, the investigation was discontinued on October 13, 1917.

STOCKTON MIDWAY OIL COMPANY, Sec. 14, T. 31 S., R. 22 E., M. D. B. & M.

vs.

ONISBO OIL COMPANY (Well No. 1), Sec. 14, T. 3 S., R. 22 E., M. D. B. & M.
June 28, 1916.

The department has not yet secured the official log of the well complained of (No. 1), and no attempt at an investigation has been made.

GENERAL PETROLEUM CORPORATION, Sec. 15, T. 31 S., R. 22 E., M. D. B. & M.
vs.
POTTER OIL CO. (Well No. 8), Sec. 15, T. 31 S., R. 22 E., M. D. B. & M.

August 3, 1916.

An investigation of this matter will be made as soon as the work on the earlier complaints is finished.

UNION OIL COMPANY OF CALIFORNIA, Sec. 34, T. 32 S., R. 24 E., M. D. B. & M.
vs.
SOUTH MIDWAY OIL COMPANY, Sec. 34, T. 32 S., R. 24 E., M. D. B. & M.

November 30, 1915.

The South Midway Oil Company property has been taken over by the Lakeview No. 2 Oil Company, and work has been begun on Well No. 23, formerly known as No. 2 or No. 4. Upon completion of the work on this well, it is understood that the company intends correcting the trouble in the well complained of, old No. 1.

AMAUROT OIL COMPANY, Sec. 5, T. 29 S., R. 28 E., M. D. B. & M.
vs.
DEL REY OIL COMPANY, Sec. 5, T. 29 S., R. 28 E., M. D. B. & M.

October, 1915.

The work of satisfying this complaint was practically completed during the previous fiscal year, as reported in Bulletin No. 73. It involved the plugging with clay of the bottom of the well (No. 1) of the Del Rey Oil Company, and recementing the water string of Well No. 2 of that company. The method used is described on page 87 in the article on Mudding Methods practiced in the Kern River field. The results were immediate, and beneficial to all surrounding property, and have proven permanent.

The behavior of the wells of the Del Rey Oil Company before and after the repairs is shown by the following table of daily production:

Well	Before repairs		After repairs	
	Oil (barrels)	Water (barrels)	Oil (barrels)	Water (barrels)
No. 1			7	5
No. 2	10	1,500	40	15
No. 3	40	40	45	6
No. 6	20	25	25	25
No. 7	20	150	45	35
No. 8	15		15	
No. 10	20	15	20	15
No. 11	10	20	10	20
Totals	135	1,750	207	121

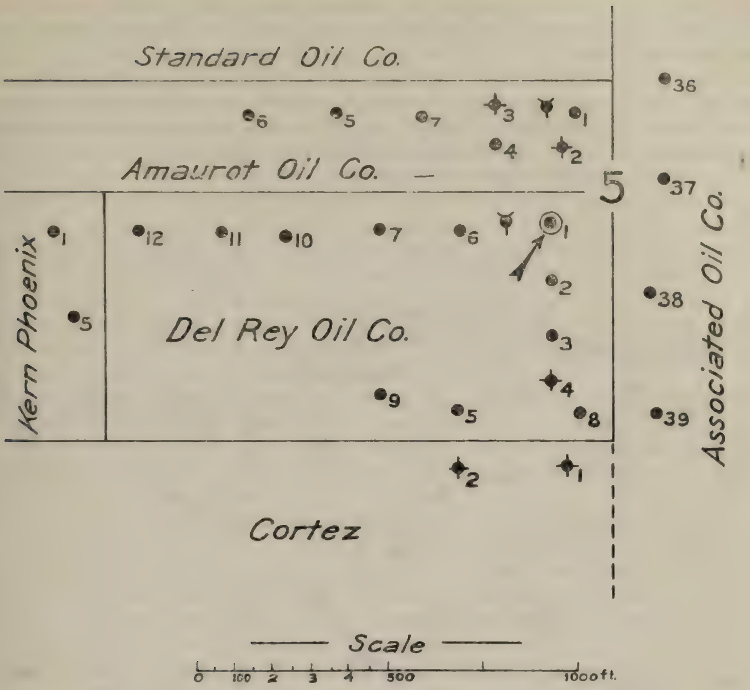


FIG. 23.

This shows that the daily production of oil from the wells was increased from 135 to 207 barrels and the daily production of water reduced from 1750 to about 120 barrels.

The area under investigation has since been enlarged and further recommendations for the correction of troubles in the vicinity have been made and a still further report is being worked on at present.

ALMA OIL COMPANY (Junior Property), Sec. 4, T. 29 S., R. 28 E., M. D. B. & M.

ASSOCIATED OIL COMPANY (Red Bank), Sec. 4, T. 29 S., R. 28 E., M. D. B. & M.

PETROLEUM DEVELOPMENT COMPANY, Sec. 4, T. 29 S., R. 28 E., M. D. B. & M.

The water troubles in this vicinity are of long standing and have withstood several attempts to overcome them.

This investigation was made at the joint request of the above named companies. The brunt of the work for this department fell to Mr. G. McGregor, then Inspector, handling the work of the Kern River field. The result of the investigation was reported to the State Oil and Gas Supervisor on January 8, 1917, and on January 24, 1917, instructions for the repair of certain wells were issued by the Supervisor in the following letter addressed to each of the above companies:

"Relative to the matter of repairing damage being done by water in the vicinity of the Alma Jr. Property in the Kern River field, we have completed a very thorough investigation.

"As the matter now stands, it is certain that both top and bottom water have access to the producing oil sands. To repair the wells that are making bottom water is a simple matter compared to correcting the top water troubles and consequently, we recommend that the bottom water conditions in Alma Jr. No. 2 and Petroleum Development Co. No. 28 be corrected first.

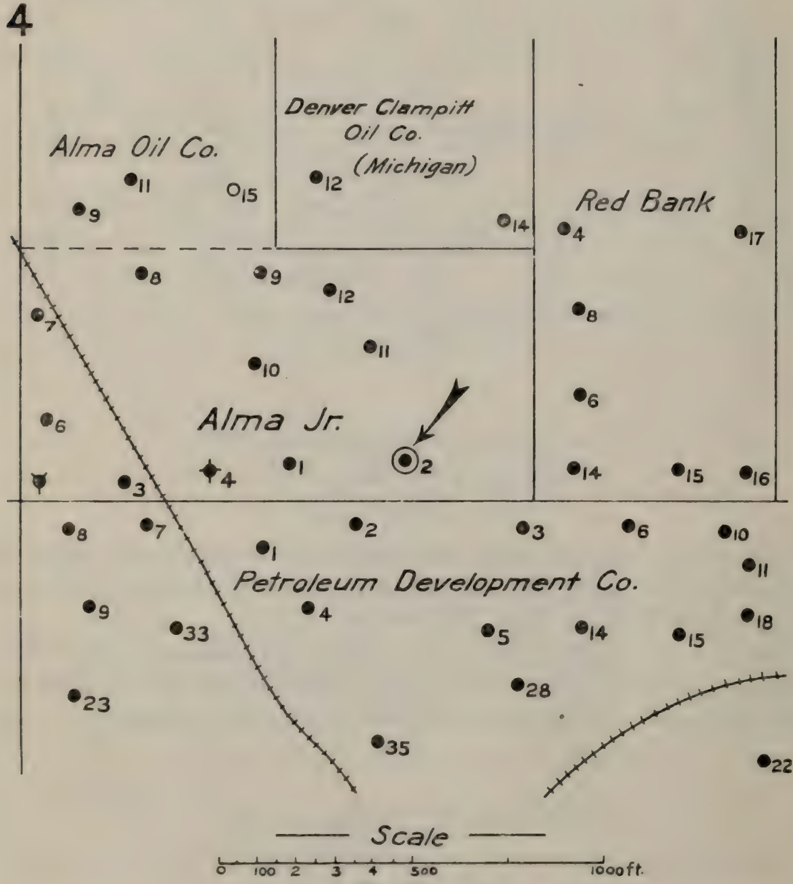


FIG. 24.

"To enable us to make a test on the jobs of plugging for bottom water it will of course be necessary to have top water shut-off. To this end the Alma Jr. Co., should immediately pull the oil string in No. 2, bridge below the point of shut-off, and bail the well for us to test. They should then redrill to original bottom, driving any old casing into the walls, and plug with cement up to 725 feet. When this cement is set, a pumping test will be necessary to determine whether or not the well still makes water. In the event that it still makes the same amount as heretofore, it will indicate that the water is being let in through the oil sands by low shut-offs of surrounding wells, and it should be allowed to stand until the latter condition is remedied.

"Petroleum Development No. 28 should be abandoned and plugged, unless this has already been done and not reported. In the latter case a report should be furnished us at once. A solid plug into the walls of the hole at a depth of 760 feet would protect the producing oil sands reported in surrounding wells. If the log of Petroleum Development No. 28 is accurate in reporting oil sands to the depth of 900 feet, nothing less than a solid plug against the walls of the hole from 900 to 760 feet would be satisfactory.

"This amount of work alone should materially improve conditions. How much of the trouble it will overcome is uncertain. It is very likely that it will be necessary eventually to establish new points of shut-off in about half of the wells in the district before an absolutely clean production of oil can be secured.

"Among those most in need of such repair are Petroleum Development Company Nos. 3, 10, 13, 14 and 28, Red Bank, Nos. 4, 6, 7, 8, 9, 10, 11, 13 and 14. This will serve to show what an undertaking it would be to establish uniform shut-offs in the district, and that brings up the question of the method to be used.

"Common practice would demand redrilling every well to be repaired, but it occurs to us that some simpler method could be devised that would enable the operators to re-establish points of shut-off a great deal cheaper. We think that some experiments along this line would result favorably.

"Should the result of the work recommended on Alma Jr. No. 2 and Petroleum Development Company No. 28 indicate that the lack of uniformity of points of shut-off are responsible for the water conditions, we recommend that shut-offs be established in Red Bank No. 14 and Petroleum Development No. 14 in conformity with those of the Alma Jr. wells.

"The above conclusions are drawn from a thorough consideration of the question given by Deputy Supervisor R. N. Ferguson and Inspector G. McGregor. These conclusions cover the matter so far as practical needs at the present time are concerned and outlines the work this department expects to see done. However, we shall be glad to later furnish the three companies with a complete report accompanied by drawings, giving the facts upon which the conclusions were based, and in order to comply with the legal requirements governing the manner in which records are maintained as confidential by this department, I would like a written statement from all three companies releasing all of this information to the three companies mentioned."

Release of the confidential information, contained in the report and drawings, to the three interested companies was later obtained and each was furnished with a copy of the report on which the above recommendations were based.

Both the Petroleum Development Company and the Alma Oil Company immediately started work as recommended. The work on Well No. 28 of the Petroleum Development Company consisted of plugging off the deep-flowing salt water well below the lowest oil measures. The work on this well was then suspended, as it was thought that a better test could be made on the success of plugging after the work on Alma Jr. No. 2 was completed, than when the sands were being flooded from that well.

Work was begun on the Alma Jr., No. 2 well, February 25, 1917, when the 3″ air line was pulled and an unsuccessful attempt was made to loosen the 7⅝″ casing. A cement plug was located in the bottom of the 7⅝″ casing at 874 feet. The 7⅝″ casing was finally loosened with two 60-ton jacks, and after raising it one point, the cement in the bottom was drilled out.

An attempt was made to plug the hole as the 7⅝″ casing was withdrawn, but was not a success as every movement of the casing caused the hole to fill with sand through the perforations. The 7⅝″ casing was pulled, the perforated pipe replaced with blank pipe and the casing run back in. As the sand had to be fought all the way down, this was a slow job and finally, when the pipe was back to about 830 feet, the string of tools was stuck in the hole by caving sand. In an attempt to hydraulic them loose, part of the 1″ pipe used was lost.

The drilling line was cut and the next two weeks spent in fishing for the pipe and tools, which were finally recovered April 30, 1917.

On May 1, 1917, Mr. J. E. Beard put the well in the hands of the State Mining Bureau, giving us authority to employ a crew and generally supervise operations. Under this arrangement a drilling crew employed by the Petroleum Development Company was engaged to begin work on the above date, and under the direct supervision of the State Mining Bureau. The Petroleum Development Company granted the men a leave of absence for the period of this work.

After several days' work it was found that it was impracticable to try to mud the hole with the sand heaving in, so the 7⅝″ casing was pulled and run back into the hole to a depth of about 702 feet, and the mudding of the well began in earnest.

The system used was to keep the tools swinging at or near the shoe of the pipe, shovelling the clay in dry and allowing a stream of water to run into the well. In this way it was hoped to mud the sands sufficiently so that the pipe could be lowered without danger of freezing. By this method the pipe was carried down to 789 feet, where it froze after about 1000 cubic yards of clay had been put in. The hole was then drilled ahead to 886½ feet, using approximately another 100 yards of clay, and the process of plugging back was begun. The hole was plugged back solid from 886½ feet to 826 feet with clay, cobbles, manila rope, etc. At this depth the well was shot with 30 pounds of 60% dynamite, the hole cleaned out and 15 sacks of cement put in through tubing. A second shot was placed at 792 feet (32 pounds of 60% dynamite) and, after cleaning out to 801 feet, eight sacks of cement were put in through tubing. A third shot was put in from 767 feet to 773 feet (50 pound of 40% dynamite) and the hole was cleaned out to 782 feet. Eleven sacks of cement were put in at this depth through tubing. A fourth shot (50 pounds of 60% dynamite) was put in from 757 feet to 765 feet. The hole was cleaned out to 765 feet and filled with clay and cobbles to 755 feet and a fifth shot put in from 745 feet to 752 feet (50 pounds of 60% dynamite). The hole was then cleaned out to 755 feet and tamped solid with clay and cobbles up to 735 feet, and a shell containing 50 pounds of 60% dynamite failed to explode.

A second shell of the same size was then set on top of the first one and exploded.

Following this the hole was cleaned out to 735 feet and after running water in for several hours 13 sacks of cement were put in through tubing. This cement filled the hole to about 722 feet and the hole was then filled up with cobbles, a heaving plug set at 702 feet, and the pipe was perforated from 684 feet to 702 feet.

While sufficient time has not elapsed since the completion of the work to obtain final figures on its beneficial effects, the present indications are that the job was a complete success.

At present the water handled in the vicinity of this well has decreased from about 16,000 barrels daily to about 250 barrels daily, and the oil output has increased from about 25 barrels daily to approximately 60 barrels daily.

The operation of two compressor plants has been made unnecessary, thereby eliminating operating expense of about $500 per month and also saving about 100 bbls. of oil used as fuel at the plants.

	Daily production before repairs		Daily production after repairs	
	Oil (barrels)	Water (barrels)	Oil (barrels)	Water (barrels)
Alma Jr.—				
No. 1	Trace	150	7	00
No. 2	00	12,000	Trace	100
No. 5	Trace	200	10	Trace
No. 11	Trace	250	7	40
No. 12	Trace	200	10	25
Pet. Dev. (Santa Fe)—				
No. 1	3	32	4	10
No. 2	00	1,440	*	*
No. 6	5	250	4	20
No. 10	5	400	5	10
No. 14	5	5	5	10
No. 18	7	1,000	7	25
Totals	25	15,927	59	240

*Not yet rigged for pumping.

About 1140 yards of clay were used in addition to several loads of cobblestones and other materials. The work extended over a period of six and one-half months, the last four and one-half months of which it was under the supervision of the State Mining Bureau. The cost of the job is shown below.

This Department is greatly appreciative of the spirit of co-operation displayed by Mr. J. E. Beard of the Alma Oil Company, who showed that at all times he was ready and willing to do anything in his power to remedy the existing conditions.

Thanks are also due to Mr. D. T. Saine, superintendent of the Petroleum Development Company, and to his drillers, Messrs. C. F. Fox and

F. McBride, for their hearty co-operation with this department, thus lessening the burden to a considerable extent.

Cost of Repairs on Well No. 2 Jr., Alma Oil Co.

Initial expense from March 1 to May 1, 1917:		
Labor	$292 50	
Lumber	85 05	
Miscellaneous material used	161 23	
Sundry general expenses	48 45	$587 23
Under supervision of State Water Commission, from May 1 to September 17, 1917:		
Labor	$4,151 98	
Lumber	95 00	
Miscellaneous materials used	401 17	
Sundry general expense	182 75	
Hauling clay	2,499 14	7,330 04
Total cost		$7,917 27

VISALIA OIL COMPANY, Sec. 14, T. 32 S., R. 23 E., M. D. B. & M.
vs.
UNION OIL COMPANY OF CALIFORNIA (Regal No. 6), Sec. 14, T. 32 S., R. 23 E., M. D. B. & M.

October 4, 1915.

On the above date complaint was made that the Union Oil Company, in drilling Well No. 6 (Regal), had damaged the property belonging to the Visalia Oil Company and operated by the Union Oil Company under the name of the Bedrock Oil Company.

The history of the well complained of would indicate that for a time it may have let water into the sand from which the Bedrock wells produced. However, since that time it has been deepened and re-cemented in such a manner as to offer reasonable assurance that the top water is excluded from the upper oil sand, as well as the sand from which the well now produces.

A. L. WEIL
vs.
MIDLAND OILFIELDS COMPANY, LTD., Sec. 12, T. 31 S., R. 22 E., M. D. B. & M.

September 7, 1916.

In response to a letter from the State Oil and Gas Supervisor under date of September 7, 1916, a preliminary examination of the property and the records was made to determine the advisability of making pumping tests of the well in question.

This was reported on by letter to the Supervisor, dated September 22, 1916, in which it was stated that there was nothing in the official records of these wells and nothing on the surface of the property to show that the wells were not properly finished.

STATE MINING BUREAU
vs.
OPERATORS ON 25 HILL.

October 5, 1916.

Under the above date letters were written to representatives of the Section Twenty Five Oil Company and the Paraffine Oil Company, stating that the Department expected to be called upon to investigate water conditions on the hill and requesting logs of the wells on certain properties

The department has a surveying crew in the field getting correct locations and elevations of the wells on the above two sections. Upon completion of the survey an extensive investigation of the territory will be made.

T. L. HANNAH
vs.
MARATHON OIL COMPANY, Sec. 24, T. 25 S., R. 18 E., M. D. B. & M.

February 11, 1917.

Complaint was made on the above date that a Mr. C. T. Doherty of the Marathon Oil Company had drilled a well on the above section in which flowing water and oil were encountered, and that no attempt had been made to shut the water off.

The well complained of drilled without notice to the department and, consequently, in violation of the law. Several visits have been made to the well, but each time the place was deserted. The well was drilled with a portable rig.

MIDWAY CONSOLIDATED, LTD.
vs.
WILKES HEAD OIL COMPANY, Sec. 4, T. 32 S., R. 23 E., M. D. B. & M.

This complaint is the outcome of the failure of the Wilkes Head Oil Company to live up to a verbal agreement made by its representatives at a conference held at the Taft office of the State Mining Bureau on October 11, 1915.

At this meeting several operators agreed to make certain repairs on their wells in the general vicinity, and the representatives of the Wilkes

Head Oil Company agreed to begin work on Well No. 1 within ten days. The well had been standing idle many months, with a water sand at a depth of 3330 feet and an oil sand at a depth of 3265 feet cased off behind the 6¼″ casing, which had been cemented at 3627 feet. In cementing the 6¼″ casing at 3627′ two lengths of 6¼″ casing had been sidetracked.

The agreement between the operators permitted the Wilkes Head Oil Company to prospect ahead with 4½″ casing, seeking a deeper oil. The understanding was that if no deeper oil was found the well would be plugged back and abandoned in such a manner as to shut the water at 3330 feet out of the oil at 3265 feet.

On January 18, 1916, this department witnessed a test of the 6¼″ casing showing that it had been successfully cemented.

No approval to do any further work on the well was given by this department, but our information is to the effect that it has since been cemented, in the 6¼″ casing, up to a depth of 3265 feet and that the 6¼″ casing has been perforated above the plug and cut off at about 3000 feet.

We have also been informed that after attempting to pump the well for a time, during which it produced about 100 barrels per day of water and 25 barrels per day of oil, all work was suspended and the well left in the above condition.

A report was made to the State Oil and Gas Supervisor on September 28, 1917, recommending certain work to remedy the condition of the well.

HONOLULU CONSOLIDATED OIL COMPANY
vs.
MIDWAY GAS COMPANY, Well No. 6, Sec. 16 T. 32 S., R. 24 E., M. D. B. & M.

March 9, 1917.

The Taft office of the State Mining Bureau received notice under the above date that complaint had been made against this well. The complaint cited the fact that the behavior of this well indicated a direct connection between the oil measures, being produced from, in it and in Well No. 11 of the Honolulu Consolidated Oil Company on Section 10, T. 32 S., R. 24 E., M. D. B. & M. It further stated that the well complained of was producing 20% emulsion, while the well liable to be damaged was producing clean oil, and added: "This means that if the upper measures are flooded by water from the Midway well, it is only a matter of time till water will appear in our well."

On March 26 the Midway Gas Company filed a proposal to test the well and determine the source of the water. The proposal was approved but work on the well has been delayed by mechanical troubles.

The department has recently been advised by the company that work is progressing more satisfactorily and that results may be expected in the near future.

PITTSBURG-BELRIDGE OIL COMPANY
vs.
THETA OIL COMPANY, or D. Y. CAMPBELL. Well in the S. ½ of the NE. ¼ of Sec. 25, T. 28 S., R. 20 E., M. D. B. & M.

April 7, 1917.

There is no development in the immediate vicinity of the well complained of and no investigation has as yet been made.

No log of this well has been furnished.

CHANSLOR-CANFIELD MIDWAY OIL COMPANY
vs.
STANDARD OIL COMPANY, Sec. 10, T. 32 S., R. 23 E., M. D. B. & M.

March 13, 1917.

A request was made for a continuation of the investigation previously started upon the informal request of both companies.

Graphic logs of the wells in question were drawn and an attempt was made to solve the problem. No satisfactory results were obtained and the matter is being held in abeyance until such time as peg models can be constructed of a considerable area in the vicinity.

BARLOW AND HILL
vs.
CRESCENT PETROLEUM CORPORATION, Sec. 2, T. 25 S., R. 19 E., M. D. B. & M.

July 30, 1917.

A letter under the above date requested that the department investigate the abandonment of the well mentioned and insure the proper plugging of the hole. The complainants were advised by letter on August 1, 1917, that all previous work on the well had received the sanction of this department, and that his proposed abandonment would no doubt be put before us in due time.

A proposal was later received and approved.

STATE MINING BUREAU

vs.

F. B. CHAPIN (Burks Oil Co., or Bay City Oil Co.). Sec. 22, T. 32 S., R. 23 E., M. D. B. & M.

August 15, 1917.

This investigation was initiated by the State Mining Bureau as a part of a general campaign to overcome the water troubles menacing this portion of the Midway oil field.

The company has furnished logs of several of its wells and is rigging up to furnish certain tests on those wells of which it claims to have no logs.

ASSOCIATED OIL COMPANY

vs.

KERN RIVER OIL COMPANY, Well No. 8, Sec. 4, T. 29 S., R. 28 E., M. D. B. & M.

March 3, 1916.

On February 27, 1917, a letter was received from the Associated Oil Company, referring to a former letter making informal complaint of the condition of the above mentioned well, and formally asking for an investigation.

Upon investigation it was learned that the Kern River Oil Company was contemplating the repair of the well. Very shortly thereafter the well was plugged in the bottom with clay. The results were very beneficial to the surrounding wells, but as yet no actual figures on production improvement have been obtained.

SAMUEL SANBORN

vs.

H. H. HENSHAW, well in Sec. 22, T. 25 S., R. 18 E., M. D. B. & M., Drilled by Devil's Den Consolidated Oil Co.

November 20, 1916.

The original complaint asked for an investigation of the abandonment, but merely referred to the well as an abandoned oil well on the southwest quarter of the section.

On November 20, 1916, the department requested a more definite location of the well in question and on November 22, 1916, this was received.

It was found that some work on these wells had previously been authorized by our Coalinga office. Mr. Sanborn was advised that the work, which had been approved, would adequately protect the territory. Lately, a proposal to do further work on the well in question has been received and is being replied to by this office.

INFORMAL COMPLAINTS AND REQUESTS FOR INVESTIGATION.

During the year informal complaints were made of the condition of the following wells of the Associated Oil Company in the Kern River field:

(Kern A) No. 12, Sec. 32, T. 28 S., R. 28 E., M. D. B. & M.

(Omar) No. 6 and No. 7, Sec. 32, T. 28 S., R. 28 E., M. D. B. & M.

(Kern) No. 9, Sec. 32, T. 28 S., R. 28 E., M. D. B. & M.

(Reed Crude A) No. 12, Sec. 32, T. 28 S., R. 28 E., M. D. B. & M.

(Reed Crude) No. 50, Sec. 32, T. 28 S., R. 28 E., M. D. B. & M.

(Canfield) No. 9, No. 14, No. 15, No. 27, No. 28, Sec. 29, T. 28 S., R. 27 E., M. D. B. & M.

(San Joaquin) No. 10 and No. 18, Sec. 5, T. 29 S., R. 28 E., M. D. B. & M.

The condition of these wells was brought to the attention of the company by a letter of the State Oil and Gas Supervisor, dated March 7, 1917. Under date of March 20, 1917, the company replied, stating in part as follows: "The informal complaints in the wells which you refer to will be thoroughly investigated."

Informal complaint was made on March 30, 1917, to the State Oil and Gas Supervisor by a Mr. McLennon of Bakersfield, of the manner in which the Bakersfield Junk Company was abandoning Well No. 2 of the Provident Oil and Mining Company on Section 25, Township 28 South, Range 27 East, M. D. B. & M. The work had been done under the close supervision of this department and up to that time was satisfactory. Work was later begun on Well No. 1 on the same property, but owing to the reluctance of the Junk Company to comply with the requirements of this department, it was finally given up before any pipe was removed from the well.

On January 22, 1917, the General Petroleum Corporation made informal complaint of the condition of two wells of the Mt. Diablo Oil, Mining and Development Company (Maylain property), Section 26, T. 32 S., R. 23 E., M. D. B. & M. On January 23, 1917, the company was asked to furnish logs of the wells. These have not yet been received. This matter will come in for thorough investigation in connection with the work just starting on the water troubles throughout sections 25 and 26, T. 32 S., R. 23 E., M. D. B. & M.

The informal complaint of the Consolidated Mutual Oil Company against the Record Oil Company, both in Section 28, T. 31 S., R. 23 E., M. D. B. & M., mentioned in Bulletin No. 73, page 124, has been held in abeyance pending the result of an investigation of the condition throughout Section 28. A more or less extensive investigation of this whole neighborhood was made and recommendations as to the repair of certain wells followed. Peg models were constructed and cross sections were made, but extreme difficulty in getting at the facts of the case was experienced, presumably on account of the fact that the title to Section 28 was being questioned by the Federal authorities. This whole section was in the hands of a receiver. As a result of the investigation the Kern Trading and Oil Company began building a rig over the crater of their Well No. 2, Section 27, T. 31 S., R. 23 E., M. D. B. & M., in the hope of being able to correct the water trouble resulting from the fire at this well while it was being drilled. The rig is now up and operations are expected to begin shortly.

About November 9, 1915, informal complaint was made by the Lakeview No. 2 Oil Company against the North American Oil Company Well No. 1, Section 4, T. 11 N., R. 23 W., S. B. B. & M., and the well of the Midway Fields Oil Company on the same section.

The former property is now being developed by Pat Welch and a well is being drilled within a few feet of the one complained of. It is not thought likely that the old well is doing any damage.

The property of the Midway Fields Oil Company is in the hands of the Receiver and no official logs of the wells have been furnished.

MISCELLANEOUS INVESTIGATIONS.

During the latter part of February, 1917, Mr. M. H. Murray made a hasty survey of the Kern River oil fields for the department, and reported on the production of oil and water from all producing wells. The information thus obtained was put on two maps, one for water and one for oil production, on each side of which a color scheme was used to denote the approximate amount each well produced.

On March 13, 1917, an investigation was started of water conditions along the west line of the southwest quarter of Section 32, T. 28 S., R. 28 E., M. D. B. & M., in the Kern River oil field. Release of the confidential information of the two interested companies was secured and a composite cross section was started. This work has not yet been completed, but when finished is to be placed at the disposal of both companies for their use in correcting the troubles along the line above referred to.

On August 15, 1917, work was started on a peg model of the N.W. ¼ of Section 31, T. 28 S., R. 28 E., M. D. B. & M., in the Kern River field. The object was to attempt to locate the source of a supposed intermediate water occurring in the vicinity. The model has since been completed but owing to the press of other work no use has as yet been made of it.

The matter of the water conditions in Section 22, T. 31 S., R. 23 E., M. D. B. & M., was the subject of a conference at the Taft office of the State Mining Bureau on September 6, 1916. At this conference representatives of the Standard and Associated oil companies met with the State Oil and Gas Supervisor. It was agreed that careful observations should be made for a time, the result of which would determine other tests to be made. The agreement was confirmed by a letter, dated September 20, 1916, from the Supervisor to each company.

Since that time the Standard Oil Company has abandoned one of the wells listed as a probable source of the water, but no improvement in the condition has been noted.

More recently the Associated Oil Company has requested a renewal of the investigation, but very little progress can be made in it until conditions in wells known to be in bad order on adjoining sections are corrected.

The manner of drilling the deep wells in the Belridge District has been brought to the attention of the Department, verbally, on numerous occasions. In an attempt to secure the adoption of a uniform method of drilling in that district, a number of operators met at the clubhouse of the Reward Oil Company at Reward, California, on December 4, 1916. The meeting was poorly attended, and while some good suggestions were offered nothing definite was accomplished.

The attention of this department was called to the fact that dye tests had previously been made by the Chanslor-Canfield-Midway Oil Co., and American Oilfields Company on wells in Section 36, T. 31 S., R. 22 E., M. D. B. & M. On January 22, 1917, these companies were asked to furnish reports of these tests. On January 31, 1917, the reports were received.

On February 13, 1917, the attention of the Department was called to the fact that the Dabney Oil Company, operating on Section 26, T. 31 S., R. 22 E., M. D. B. & M., had drilled its Well No. 8 into bottom water and was preparing to case this water off with the upper producing oil measures of the district. The matter was taken up with the Dabney Oil Company, with the result that it was allowed to prospect deeper with the understanding that the condition would be corrected later. It was claimed by the company that no sand had been encountered at the depth where the producing oil measures had been expected.

LIST OF DECISIONS ISSUED IN KERN COUNTY OIL FIELDS.

T. 23 S., R. 17 E., M. D. B. & M.

Section 7.

Dominion Oil Co.

Well No. 1, abandon. DD-751.

Notice May 7, 1917, to pull casing and shut-off in accordance with the law. Reply May 9, 1917, specified plugs against the walls of the hole at four places and filling balance of hole with clay.

T. 23 S., R. 22 E., M. D. B. & M.

Section 12.

B. B. & E. R. Dudley Petroleum Co.

Well No. 1, commence drilling. DD-659.

Notice April 7, 1917, to shut-off at 1500′. Reply April 9, 1917, recommended that shut-off be made above the first showing of oil or gas, and showing tested.

T. 25 S., R. 19 E., M. D. B. & M.

Section 2.

Crescent Petroleum Co.

Well No. 1, redrill. DD-546.

Notice by letter, February 11, 1917. Reply February 13, 1917, that 8¼″ casing be cemented as proposed, to test showing.

Well No. 1, shut-off. D-740.

Notice March 27, 1917, describing tests and results and proposing to deepen. Test as described, accepted without visit and reported.

Well No. 1, deepen. DD-633.

Proposal to deepen approved.

Well No. 1, shut-off. D-896.

Notices of tests, April 27, 1917, and May 10, 1917, canceled by telephone. Final notice June 6, 1917. Tested and reported satisfactory shut-off June 15, 1917.

T. 26 S., R. 20 E., M. D. B. & M.

Section 3.

B. B. & E. R. Dudley Petroleum Co.

Well No. 2, deepen. DD-291.

Approved proposal contained: Notice October 14, 1916, to make lower shut-off.

Well No. 2, shut-off. D-566.

Bailed dry. Hole kept open by means of perforated liner. Test satisfactory.

Well No. 2, deepen. DD-723.

Approved proposal received April 30, 1917, to deepen 40′ to improve production.

Well No. 6, commence drilling. DD-661.

Recommended shut-off above oil from 205′ to 270′ as shown in No. 2, and tests by the department.

Associated Oil Co.

Well No. 2, commence drilling. DD-773.

Recommended that instead of making shut-off as proposed at 1300′, it be made above upper oil zone.

SECTION 11.

B. B. & E. R. Dudley Petroleum Co.

Well No. 1, shut-off. D-385.

Test of 8¼″ showed 100′ of oil. No water. Recommended thorough test before deepening.

Well No. 1, deepen. DD-507.

Approved proposal to deepen through first oil sand.

Well No. 1, deepen. DD-695.

Approved proposal to deepen to other sands.

Associated Oil Co.

Well No. 1, begin drilling. DD-663.

Approved proposal as submitted.

Well No. 1, shut-off. D-909.

Test of shut-off above the proposed depth reported satisfactory.

SECTION 12.

Baker & Henshaw.

Well No. 1, deepen. AA-272.

Reported that damage might result from the proposed deepening.

Well No. 1, shut-off. A-198.

Reported test satisfactory without visit, on information furnished by operator in letter, dated September 3, 1916. Letter September 17, 1916, stated that warm salt water had broken into well at 6:30 a.m. September 15, 1916. Reply September 18, 1916, requested log.

Well No. 2, shut-off. AA-242.

Reply to letter describing work of mudding and cementing. Recommended pumping test. Replied November 28, 1916, on Form 113 to notice of deepening, requesting statement of present condition and result of mudding job. Letter received December 1, 1916, stated no mud had been put in this well.

Well No. 3, commence drilling. DD-380.

Approved proposal to drill. Recommended shut-off above and below sulphur water.

Well No. 3, shut-off. D-707.

Test of plugging off sulphur water inconclusive.

Recommended further test.

Well No. 3, shut-off. D-709.

Test inconclusive. Recommended pumping test.

Well No. 4, begin drilling. DD-667.

Recommended that top sands be tested and that any deepening be made the subject of a new proposal.

SECTION 13.

Associated Oil Co.

Well No. 6, deepen. AA-310.

Authorized deepening as proposed.

Well No. 10, redrill. DD-753.

Authorized proposal to plug for bottom water. Recommended plugging bottom sand in adjoining well before plugging higher in this one.

Well No. 14, redrill. DD-882.

Authorized proposal to perforate first string of pipe opposite shallow sands.

Associated Oil Co.

Well No. 25, redrill. DD-756.

Approved proposal to free oil string and plug lower portion of hole to shut off water.

Well No. 33, shut-off. A-155.

Repeated tests showed decreasing amounts of water. Recommended production test.

Well No. 34, begin drilling. AA-209.

Authorized proposal to experiment on an inside well in cementing off oil and water behind same string of pipe, and in this, a line well, provided proof could be given that oil sands so cased off were protected.

Well No. 34, plug bottom. DD-326.

Authorized proposal to plug hole from 1130′ to 775′ and test oil measures at 775′, and requested report on test of the 10″ shut-off.

Well No. 34, shut-off. D-547.

Reporting test by Special Deputy W. L. McLaine that 10″ shut-off had failed.

Well No. 34, redrill. DD-883.

Authorized proposal to perforate 10″ and test tar sands behind it.

Well No. 35, commence drilling. AA-317.

Authorized drilling the well as proposed.

Well No. 35, shut-off. D-377.

Reported test of shut-off satisfactory.

Well No. 35, redrill. DD-378.

Confirmed advice received from the company that well had been plugged for bottom water.

Well No. 36, shut-off. D-591.

12½″ shut-off tested and found satisfactory.

Well No. 36, shut-off. D-625.

10″ shut-off not conclusive. Recommended that well be finished and water shut off in surrounding wells.

Well No. 36, redrill and plug. DD-569.

Authorized plugging bottom of hole but recommended bailing test before placing upper portion of plug. Letter of February 28, waived bailing test in favor of pumping test.

Well No. 36, shut-off. D-708.

Reported test of lower portion of plug satisfactory.

Well No. 37, begin drilling. DD-664.

Approved proposal as submitted.

Well No. 37, shut-off. D-824.

Pumping test indicated that the well had been satisfactorily finished.

General Petroleum Co.

Well No. 9-B, commence drilling. DD-857.

Authorized proposal to produce top oil without landing a water string, provided no water should be encountered above the oil.

Well No. 10-B, commence drilling. DD-858.

Approved proposal to drill with one string of pipe if no top water was encountered.

Well No. 11-B, commence drilling. DD-859.

Approved proposal to finish with one string of pipe, but recommended a shut-off should top water be encountered.

Well No. 17-B, commence drilling. DD-860.

Approved proposal to finish with one string of pipe, but recommended a shut-off should top water be encountered.

Well No. 19-B, commence drilling. DD-861.

Approved proposal as submitted but recommended a shut-off before drilling into oil sand should upper water be encountered.

Lost Hills Development Co.

Well No. D-3, deepen. AA-304.

Approved proposal to deepen 100′. Requested report on tank gauges.

Well No. D-4, deepen. AA-305.

Approved proposal to deepen 100′. Requested report on tank gauges.

Well No. D-5, deepen. AA-306.

Approved proposal to deepen 100′ and requested production reports.

Well No. C-4, commence drilling. DD-364.

Approved as proposed: "To drill with one string unless top water is found."

B. B. & E. R. Dudley Petroleum Co.

Well No. 1, redrill. DD-292.

Approved proposal to plug for bottom water.

Well No. 2, redrill. AA-238.

Recommended that well be plugged from bottom by stages to 530′ if necessary.

Well No. 4, shut-off. A-206.

Report of test of shut-off my Special Deputy E. J. Schneider. Passed for production test.

Well No. 4, deepen. DD-290.

Approved proposal to make lower shut-off on account of encountering more water.

Well No. 4, shut-off. D-372.

Tested the deeper shut-off and found it satisfactory.

Well No. 4, deepen. DD-772

Authorized deepening 100′.

Well No. 5, shut-off. D-648.

Satisfactory test.

Well No. 8, shut-off. A-156.

Report of test witnessed by Mr. R. E. Stearns. Water shut-off.

Well No. 9, commence drilling. AA-220.

Approved as proposed.

Well No. 9, shut-off. A-171.

Report of shut-off witnessed by Special Deputy E. J. Schneider. Satisfactory.

Well No. 10, commence drilling. AA-286.

Approved drilling as proposed.

Well No. 10, shut-off. D-554.

Reported shut-off satisfactory based on operator's production report.

T. 26 S., R. 20 E., M. D. B. & M.

SECTION 24.

California Star Oil Co.

Well No. 1, bridge over the oil sand. AA-266.

Authorized plugging above oil sands and producing water from top water sands.

Well No. 1, redrill. DD-286.

Authorized proposal to commence plugging until sands previously thought of as top water sands were plugged off and attempt to produce sands above that point logged as tar sands.

Well No. 2, deepen. AA-265.

Authorized proposal to deepen to lower sands, and test them for production.

Well No. 2, redrill. DD-294.

Authorized proposal to test shallow sands cemented off behind the 10″ casing.

Well No. 3, redrill. DD-295.

Authorized proposal to produce shallow sands previously cemented off behind the 10″ casing.

Well No. 4, cement at about 380′. AA-271.

Approved proposal to drill well as outlined in letter dated August 10, 1916, amplifying original proposal.

California Star Oil Co.

Well No. 4, redrill. DD-287.

Authorized proposal to produce upper sands shut-off behind the 10″ casing and previously regarded as tar sands.

Well No. 5, continue drilling. AA-302.

Approved changed plan to allow of testing tar sands which it was originally intended to cement off.

Well No. 5, shut-off. D-555.

Reported production test made by the company which showed that if any top water existed it was shut off from the shallow oil.

Well No. 7, commence drilling. AA-323.

Authorized proposal to produce upper sands.

Well No. 7, shut-off. D-556.

Reported production test made by the company showing negligible amount of water.

Well No. 8, commence drilling. DD-844.

Authorized proposal to produce top sands.

Well No. 9, continue drilling. AA-301.

Approved amplified proposal to drill and produce the upper sands.

Well No. 9, shut-off. D-557.

Reported production test made by company showing negligible amount of water.

Well No. 10, begin drilling. DD-563.

Approved proposal to drill as outlined.

Well No. 11, begin drilling. DD-596.

Approved proposal to drill as outlined.

Well No. 13, redrill. DD-296.

Authorized proposal to pull or perforate the 10″ casing in order to produce sands cemented off behind it.

Well No. 14, cement at about 395′. AA-215.

Authorized proposal to drill as outlined.

Well No. 14, shut-off. A-168.

Report of test witnessed by Special Deputy W. L. McLaine. Passed for production test on account of heaving sand.

Well No. 14, redrill. DD-297.

Authorized proposal to pull or perforate the 10″ casing and produce sands previously shut off behind same.

Well No. 14, shut-off. D-558.

Report of production test made by the company showing upper sands to be practically free of water.

Well No. 15, drill. DD-643.

Approved proposal to produce top sands.

Well No. 17, shut-off. A-161.

Reported pumping test made by the company before completing well which proved that upper productions were free of water.

Well No. 17, shut-off. A-183.

Production test witnessed which showed no water in the upper oil formations.

Well No. 17, redrill. DD-298.

Authorized proposal to pull or perforate 10″ and produce upper oil sands.

Well No. 18, commence drilling. AA-241.

Authorized as proposed.

Well No. 18, test by pumping. AA-267.

Authorized change in proposal to complete well with one string and test by pumping.

Well No. 18, shut-off. A-184.

Production test witnessed showing that the well finished with one string of pipe produced only 8/10% of water.

Well No. 18, redrill. DD-299.

Authorized proposal to perforate the one string of pipe in the hole.

California Star Oil Co.

Well No. 21, shut-off. A-159.

Reported bailing test witnessed by Special Deputy W. L. McLaine. Passed for pumping test on account of heaving sands.

Well No. 21, redrill. DD-300.

Approved proposal to pull or perforate the 10″ and produce top sands.

Well No. 21, shut-off. D-559.

Reported production test made by the company which showed 7% of water in the oil from the top sands.

Well No. 25, commence drilling. DD-539.

Authorized drilling as proposed.

Well No. 29, begin drilling. DD-771.

Authorized drilling as proposed. Company letter received June 11, 1917, asking for investigation of water showing in well. Reply June 11 stated that investigation had been started.

Well No. 30, commence drilling. DD-854.

Authorized proposal as outlined. Letter received June 20th stated water unexpectedly encountered. Reply June 27th, asked for logs.

Security Oil Co.

Well No. 1, commence drilling. DD-344.

Authorized drilling as outlined and recommended that if water is encountered it be shut off before entering oil sand.

Well No. 1, deepen. DD-517.

Authorized proposal to deepen to depth of an offsetting well.

Well No. 2, commence drilling. DD-345.

Authorized proposal to drill recommending that water be shut off if encountered.

Well No. 3, begin drilling. DD-654.

Authorized proposal to drill recommending that a shut-off be made if water is encountered.

Well No. 4, drill. DD-644.

Authorized proposal to drill recommending that shut-off be made before entering oil sand if water was found.

Well No. 15, begin drilling. DD-655.

Authorized proposal to drill; recommended that if water was found it be shut off before drilling in the oil sand.

Well No. 16, begin drilling. DD-759.

Authorized proposal to drill; recommended shutting off top water if encountered.

Well No. 26, begin drilling. DD-760.

Authorized drilling; recommended that top water be shut off if encountered.

T. 26 S., R. 21 E., M. D. B. & M.

SECTION 19.

General Petroleum Corporation.

Well No. 28, begin drilling. DD-821.

Approved proposal to drill; recommended a shut-off to exclude upper water if encountered.

Well No. 50, begin drilling. DD-820.

Approved proposal to drill; recommended a shut-off to exclude upper water if encountered.

Well No. 62, begin drilling. DD-822.

Approved proposal to drill; recommended a shut-off to exclude upper water if encountered.

Well No. 63, begin drilling. DD-823.

Approved proposal to drill with one string providing no top water is found.

Well No. 67, begin drilling. DD-824.

Approved proposal to drill with one string providing no top water is found.

General Petroleum Corporation.

Well No. 75, begin drilling. DD-825.

Approved proposal to drill. Recommended that top water be shut off if encountered.

Well No. 76, begin drilling. DD-826.

Approved proposal to drill. Recommended that top water be shut off if encountered.

Well No. 77, begin drilling. DD-827.

Approved proposal to drill. Recommended that top water be shut off if encountered.

Well No. 78, begin drilling. DD-812.

Approved proposal to drill. Recommended that top water be shut off if encountered.

Well No. 78-A, begin drilling. DD-828.

Approved proposal to drill. Recommended that top water be shut off if encountered.

Well No. 82, begin drilling. DD-829.

Approved proposal to drill. Recommended that top water be shut off if encountered.

Well No. 83, begin drilling. DD-830.

Approved proposal. Recommended that top water be shut off if encountered.

Well No. 84, begin drilling. DD-813.

Approved proposal but recommended that top water be shut off if encountered.

Well No. 89, begin drilling. DD-814.

Approved proposal specifying that top water be shut off if encountered.

Well No. 90, begin drilling. DD-831.

Approved proposal specifying that any top water be shut off before drilling in.

Well No. 100, begin drilling. DD-815.

Approved proposal specifying that any top water encountered be shut off.

Lost Hills Development Co.

Well No. G-1, commence drilling. DD-552.

(Now G. P. Co. Well No. 86.)

Approved as proposed.

Well No. G-2, commence drilling. DD-553.

(Now G. P. Co. Well No. 85.)

Approved as proposed.

Well No. H-1, commence drilling. AA-293.

(Now G. P. Co. Well No. 87.)

Approved as proposed.

Well No. H-2, commence drilling. DD-554.

(Now G. P. Co. Well No. 88.)

Approved as proposed.

Well No. I-1, commence drilling. AA-294.

(Now G. P. Co. Well No. 102.)

Approved as proposed.

Well No. I-2, commence drilling. DD-555.

(Now G. P. Co. Well No. 101.)

Approved as proposed.

Well No. J-1, commence drilling. AA-228.

(Now G. P. Co. Well No. 103.)

Approved as proposed.

Well No. K-1, commence drilling. AA-230

(Now G. P. Co. Well No. 118.)

Approved as proposed.

Well No. L-1, commence drilling. AA-231.

(Now G. P. Co. Well No. 119.)

Approved as proposed.

Lost Hills Development Co.
Well No. M-1, commence drilling. AA-227.
(New G. P. Co. Well No. 134.)
Approved as proposed.
Well No. N-1, commence drilling. AA-226.
(Now G. P. Co. Well No. 135.)
Approved as proposed.

General Petroleum Corporation.
Well No. 104, begin drilling. DD-816.
Approved proposal specifying that any top water encountered be shut off.
Well No. 105, begin drilling. DD-817.
Approved proposal specifying that any top water encountered be shut off.
Well No. 116, begin drilling. DD-832.
Approved proposal specifying that top water be shut off if encountered.
Well No. 117, begin drilling. DD-818.
Approved proposal specifying that top water be shut off if encountered.
Well No. 120, begin drilling. DD-819.
Approved proposal specifying that any top water encountered be shut off.
Well No. 121, begin drilling. DD-833.
Approved proposal specifying that any top water encountered be shut off.
Well No. 132, begin drilling. DD-834.
Approved proposal specifying that any top water encountered be shut off.
Well No. 133, begin drilling. DD-835.
Approved proposal specifying that any top water encountered be shut off.

Lost Hills Development Co.
Well No. B-5, commence drilling. AA-297.
(Now G. P. Co. Well No. 20.)
Approved top water shut-off at 450′.
Well No. B-9, commence drilling. AA-298.
(Now G. P. Co. Well No. 16.)
Approved top water shut-off at 450′.
Well No. C-8, commence drilling. DD-279.
(Now G. P. Co. Well No. 32.)
Approved top water shut-off at about 450′.
Well No. D-5, deepen. DD-506.
(Now Well G. P. No. 44.)
Authorized proposal to deepen 55′.
Well No. D-6, deepen. AA-229.
(Now G. P. Well No. 43.)
Approved proposal to deepen.
Well No. E-5, commence drilling. AA-299.
(Now G. P. Co. Well No. 53.)
Approved top water shut-off at 450′.
Well No. E-6, commence drilling. AA-300.
(Now G. P. Co. Well No. 54.)
Approved top water shut off at 450′.
Well No. F-3, drill in, DD-367.
(Now G. P. Co. Well No. 74.)
Authorized drilling the well in without cementing.
Well No. F-5, commence drilling. DD-278.
(Now G. P. Co. Well No. 72.)
Approved top water shut off at 450′.

SECTION 29.

Associated Oil Co.
Well No. 1-C, redrill and plug. DD-515.
Authorized pulling pipe back and plugging.

Associated Oil Co.
  Well No. 1-E, redrill. DD-336.
    Authorized deepening specifying that sands between shoes of the 8¼″ and 10″ casing be thoroughly mudded.
  Well No. 1-E, deepen and cement. DD-342.
    Approved proposal to use cement instead of mud to seal sands between shoes of 8¼″ and 10″ casings.
  Well No. 1-E, shut-off. D-563.
    Satisfactory test of shut-off by 8¼″ casing.
  Well No. 2-B, begin drilling. DD-570.
    Approved proposal as outlined.
  Well No. 2-B, shut-off. D-714.
    Approved test of shut-off as satisfactory.
  Well No. 2-C, drill. DD-612.
    Authorized proposal as outlined.
  Well No. 2-C, shut-off. D-800.
    Approved as satisfactory.
  Well No. 3-C, commence drilling. DD-856.
    Authorized proposal to shut off at 650′.

SECTION 30.

Universal Oil Co.
  Well No. 5, abandon. AA-214.
    Specified that bottom water be plugged before abandoning the well and placing upper plugs.
  Well No. 12, deepen. AA-256.
    Authorized prospecting. Recommended temporary shut-off below a probable edge—water sand.
  Well No. 12, shut-off. A-196.
    Report of test of shut-off witnessed by Special Deputy C. J. Schneider. Indeterminate.

Devils Den Consolidated Oil Co.
  Well No. 9, redrill. DD-680.
    Authorized proposal to plug for bottom water.

SECTION 32.

Universal Oil Co.
  Well No. 13, redrill. AA-279.
    Authorized proposal to shut off water and test first oil sand.
  Well No. 32, redrill. DD-624.
    Approved proposal to replace oil string and carry same through the oil sand.

T. 26 S., R. 26 E., M. D. B. & M.

SECTION 11.

Hale Syndicate.
  Well No. 1, drill. DD-475.
    Authorized drilling point of shut-off to be determined by results of drilling.

T. 27 S., R. 19 E., M. D. B. & M.

SECTION 8.

Standard Oil Co.
  Well No. 1, shut-off. D-366.
    Test of shut-off satisfactory.
Standard Mercantile Co.
  Well No. 1, shut-off. D-770.
    Shut-off approved as satisfactory.

T. 27 S., R. 20 E., M. D. B. & M.

SECTION 20.

Petroleum Midway Co., Ltd.

Well No. 1, commence drilling. AA-325.

Authorized proposal as outlined and requested notice of any change of plans.

SECTION 26.

Belridge Oil Co.

Well No. 12, commence drilling. DD-282.

Authorized proposal as outlined.

Well No. 14, shut-off. D-760.

Approved test as satisfactory, mentioned fact that large size and light weight of pipe rendered bailing deeper inadvisable. Recommended cementing the next string with sufficient cement to reach the shoe of this one in order to prevent water level inside this pipe getting so low as to endanger a collapse.

SECTION 27.

Belridge Oil Co.

Well No. 7, shut-off. A-170.

Reported on information furnished by the company that well flowed oil after bailing. Passed for production test.

Well No. 11, commence drilling. DD-281.

Authorized proposal as outlined.

Well No. 7, shut-off. A-181.

Production test after well had flowed three days showed no water in oil.

Well No. 8, commence drilling. AA-252.

Approved proposal, specifying that water be shut off 50′ higher than proposed.

Well No. 10, commence drilling. AA-255.

Approved proposal as outlined.

Well No. 10, shut-off. D-365.

Reported witnessing satisfactory test.

Well No. 10, shut-off. D-612.

Reported witnessing satisfactory test.

Well No. 10, deepen. DD-597.

Authorized proposal to deepen to increase production.

SECTION 34.

Reward Oil Co.

Well No. 2, cement 10″ at 2800′. AA-261.

Rejected proposal to deepen until the department had been furnished results of attempts to produce from above the depth of 2800′.

Well No. 2, shut-off. A-169.

Report of test of 12½″ casing, from information furnished by the company, shut-off approved.

Well No. 2, shut-off. D-661.

Reported witnessing satisfactory test of shut-off, and that cementing had stopped flow of oil outside the string cemented.

Well No. 3, shut-off. D-527.

Reported satisfactory test of 12½″ casing which had been cemented with 40 sacks at the shoe and had had six tons pumped out through collapsed casing at 1854′.

Well No. 3, shut-off. D-654.

Reported satisfactory test of shut-off by 10″ casing.

Well No. 3, shut-off. D-741.

Reported witnessing test showing rise in water level. Recommended further test.

Well No. 3, shut-off. D-743.

Reported witnessing test showing uniform rise in water level. Advised screwing up pipe and further test.

Reward Oil Co.

Well No. 3, shut-off. D-746.

Reported witnessing test showing rise of one foot per hour probably due to casing leak. Passed with the recommendation that if leak became worse a further shut-off be made.

Standard Oil Co.

Well No. 1 (Barneson), commence drilling. AA-224.

Approved as proposed.

Well No. 1, shut-off. D-621.

Reported that shut-off in the 10″ casing prevents water from above 2040′ penetrating oil sands below that depth, but that failure of 12½″ shut-off not previously reported endangers the oil horizon at about 2400′ which is productive in neighboring wells.

Well No. 1 (Barneson), shut-off. D-884.

Reported test of shut-off by 8¼″ casing at 4015′, showed slight rise in water level thought to be due to oil coming in.

SECTION 35.

Belridge Oil Co.

Well No. 1, redrill. DD-385.

Requested log-casing record and proposed method of protecting upper oil zone.

Well No. 1, redrill. DD-535.

Recommended that hole be mudded under pressure as proposed before cementing.

Well No. 1, redrilling. DD-670.

Approved amended proposal to fill with mud behind the 6¼″ casing instead of the 8¼″ casing as proposed (on account of 8¼″ casing having gone back at shoe joint) and to pull 8¼″ and 10″ casing.

Well No. 1, shut-off. D-803.

Reported satisfactory test of shut-off.

Well No. 2, shut-off. A-162.

Reported satisfactory test of shut-off.

Well No. 2, shut-off. A-162.

Reported satisfactory test based on information furnished by the company. Passed for production test.

Well M. M. No. 2, redrill. DD-534.

Authorized proposal to test cementing of 4¾″ casing and clean out to original bottom.

Well No. 4, shut-off. A-153.

Reported satisfactory test based on information furnished by the company. Passed for production test.

Well No. 4, redrill. DD-351.

Authorized proposal to cement 4¾″ string in attempt to shut off water.

Well No. 4, abandon. DD-571.

Authorized proposal to abandon hole, specifying certain plugging and tests thereon.

Well No. 4, shut-off. D-756.

Approved plugging at 3140′.

Well No. 9, commence drilling. AA-253.

Recommended shut-off at 2300′ instead of 3300′ as proposed and tests of all formation below shut-off.

Well No. 9, shut-off. D-626.

Reported witnessing satisfactory test of shut-off at 1730′.

Well No. 9, shut-off. D-811.

Reported witnessing satisfactory test of shut-off at 2330′. Hole showing oil.

SECTION 36.

Union Oil Company.

Well No. 2 (Gibson), commence drilling. DD-868.

Approved proposal to shut off at 400′ and test shallow sands.

Union Oil Co.

Well No. 1, shut-off. A-152.

Reported test of formations between 693′ to 3100′ based on information furnished by company. Recommended bailing test.

Well No. 1, deepen. DD-288.

Approved proposal to cement 8¼″ casing at 3850′ with enough cement to seal formations up to 2580′, providing it will be shown that the work prevents water entering formations above 3200′.

Well No. 1, shut-off. D-553.

Reported water shut-off at shoe of 8¼″ casing at 3850′, but that sealing of formations to 3580′ failed as shown by the fact that water and oil were flowing outside the 8¼″ casing.

Well No. 1 (Belridge), shut-off. D-610.

Reported water shut-off at shoe of 6¼″ at 4006′, but that water and gas were flowing between the 6¼″ and the 8¼″ and that a gas stratum was being flooded.

Well No. 1, deepen. DD-528.

Approved proposal to free 6¼″ casing and cement deeper. Recommended mudding off gas stratum.

Well No. 1 (Gibson), commence drilling. DD-501.

Approved top water shut-off at 750′. Recommended second shut-off above second water and third shut-off below it.

Well No. 1 (Gibson), shut-off. D-598.

Reported witnessing satisfactory test at 655′ and good showing of heavy oil at that depth.

Well No. 1 (Gibson), redrill and plug. DD-533.

Approved proposal to plug off water at 1057′ and test sands above.

Standard Oil Co.

Well No. 1 (Gibson), abandon. DD-621.

Approved proposal to continue plugging from 4230′ and abandon.

T. 27 S., R. 21 E., M. D. B. & M.

SECTION 4.

General Petroleum Corporation.

Well No. 8, redrill and cement. DD-514.

Approved proposal as outlined—to make lower shut-off.

Well No. 8-A, shut-off. D-688.

Reported witnessing test that showed shut-off unsuccessful.

Well No. 8-A, shut-off. D-776.

Reported witnessing a test that showed small amount of water coming into hole. Passed for production test.

Well No. 10-A, shut-off. A-200.

Reported test based on information furnished by the company. Shut-off satisfactory.

Well No. 42-A, commence drilling. AA-263.

Approved point of shut-off providing that it be made at the same depth stratigraphically as surrounding wells.

Well No. 42-A, deepen and re-cement. DD-310.

Authorized proposal to cement off the upper oil sand (thought to carry water) and produce lower.

Well No. 43-A, shut-off. A-187.

Reported witnessing production test showing oil practically free of water.

Well No. 48-A, commence drilling. AA-264.

Approved as satisfactory the proposed depth of shut-off.

Well No. 49-A, shut-off. A-201.

Reported test based on information furnished by the company. Shut-off approved.

General Petroleum Corporation.

Well No. 50, shut-off. A-202.

Reported test based on information furnished by the company. Shut-off approved.

Well No. 51-A, shut-off. A-188.

Reported witnessing production test showing 1/10 per cent water.

Well No. 53-A, commence drilling. AA-318.

Proposal approved as outlined.

Well No. 53-A, shut-off. D-512.

Reported witnessing satisfactory test of shut-off at the depth proposed.

Well No. 54-A, shut-off. A-203.

Report of test of shut-off made by the company approved.

Well No. 55-A, shut-off. A-204.

Report of test of shut-off made by the company approved.

Standard Oil Company.

Well No. 54, shut-off at 1920′. AA-216.

Approved proposal specifying that enough cement be used to seal all formation up to a depth of 1750′ to protect offsetting wells with a higher shut-off.

Well No. 54, shut-off. A-191.

Reported satisfactory test of shut-off based on information furnished by the company.

SECTION 5.

B. B. & E. R. Dudley Petroleum Co.

Well No. 1, redrill. AA-237.

Authorizing verbal proposal to put in 6¼″ perforated liner instead of redrilling as proposed.

General Petroleum Co.

Well No. 3-B, shut-off. A-190.

Reported witnessing production test showing well to produce only small amount of water.

Well No. 4-B, shut-off. A-189.

Reported satisfactory test of shut-off based on information furnished by the company.

Well No. 8-B, commence drilling. AA-315.

Approved proposal as outlined, but noted that notice of test of shut-off was received before notice of intention to drill.

Well No. 8-B, shut-off. A-209.

Reported satisfactory test of shut-off based on information furnished by the company.

Universal Oil Co.

Well No. 1, deepen. DD-335.

Approved proposal to cement off upper sand and drill into second sand.

Well No. 1, shut-off. D-545.

Reported witnessing satisfactory test of landing of pipe used to case off upper oil sand.

Standard Oil Co.

Well No. 10, shut-off. D-578.

Reported that production reports submitted by the company indicated that top water was shut off.

SECTION 9.

D. J. Oil Co.

Well No. 2, shut-off. D-544.

Reported witnessing test of shut-off and requesting further bailing which as reported by the company indicated satisfactory shut-off.

Well No. 3, commence drilling. AA-284.

Approved proposal as outlined.

D. J. Oil Co.
Well No. 3, shut-off. D-649.
Reported witnessing satisfactory test of shut-off.

Standard Oil Co.
Well No. 50, shut-off. D-579.
Reported satisfactory top water shut-off based on monthly production reports of the company.

SECTION 17.

Associated Oil Co.
Well No. 1, plug bottom. DD-547.
Approved proposal as outlined to pull 6¼″ and 8¼″ casings and fill hole with cement from 5324′ to 3177′.
Well No. 1, abandon. DD-625.
Approved proposal to cut and pull 8¼″ casing from about 1800′. Withheld decision on balance of proposal.
Well No. 1, abandon. DD-632.
Recommended attempting to force cement through collapsed pipe to fill bottom of hole or redrilling below bad place and shooting and plugging.
Well No. 1, abandon. DD-642.
Recommended shooting at the collapsed place and plugging shot cavity. Waived redrilling required in former report on account of receipt of reports from company of tests on the lower portion of the hole.

T. 28 S., R. 21 E., M. D. B. & M.

SECTION 30.

Pittsburg-Belridge Oil Co.
Well No. 4, shut-off. D-592.
Reported witnessing satisfactory test of top water shut-off.
Well No. 5, begin drilling. DD-572.
Approved proposal as outlined.
Well No. 5, shut-off. D-737.
Reported satisfactory test of shut-off.
Well No. 6, begin drilling. DD-665.
Approved proposal as outlined.
Well No. 6, shut-off. D-865.
Reported witnessing satisfactory test of top water shut-off.

SECTION 32.

Belridge Oil Co.
Well No. 391, abandon. DD-709.
Recommended plugging between 768′ and 780′ or filling with rotary mud before dismantling rig as proposed.
Well No. 393, abandon. DD-710.
Recommended plugging between 670′ and 730′ or filling with rotary mud before dismantling rig.
Well No. 395, abandon. DD-711.
Recommended plugging between 675′ and 732′ or filling with rotary mud before dismantling rig.

SECTION 33.

Belridge Oil Co.
Well No. 112, shut-off. A-148.
Reported witnessing production test showing large percentage of water. Recommended further tests.
Well No. 112, shut-off. A-192.
Reported witnessing production test showing large percentage of water. Requested regular production gauges.

Belridge Oil Co.

Well No. 135, abandon. DD-283.

Approved proposal to move rig and drill new well.

Well No. 209, commence drilling. AA-254.

Authorized proposal to drill to second zone providing the water is excluded from upper zone.

Well No. 209, shut-off. D-560.

Reported witnessing satisfactory test of top water shut-off.

Well No. 209, shut-off. D-586.

Reported witnessing satisfactory test of the oil protection string.

Well No. 210, commence drilling. DD-284.

Approved proposal as outlined.

Well No. 210, shut-off. D-507.

Reported witnessing satisfactory test of top water shut-off.

Well No. 408, shut-off. A-154.

Reported satisfactory test of landing of 10″ casing based on information furnished by the company. Referred to letter concerning non-protection of upper sands.

Well No. 408, deepen. DD-558.

Approved proposal to deepen as outlined.

Well No. 411, begin drilling. DD-653.

Approved proposal to drill as outlined.

Well No. 411, shut-off. D-775.

Reported witnessing satisfactory test of top water shut-off.

T. 28 S., R. 27 E., M. D. B. & M.

SECTION 5.

Standard Oil Co.

Well No. 1, shut-off. D-275.

Reported shut-off indeterminate without visit. Authorized prospecting ahead.

Well No. 1, abandon. DD-419.

Authorized abandonment, recommending additional work.

SECTION 15.

Well No. 2, abandon. DD-467.

Approved work outlined but specified additional plugging between 2490′ and 2530′.

May 29th received report of abandonment which showed plugging specified from 2490′ to 2530′ had not been done.

Replied May 31st stating that on account of failure to place the plug, approval of the abandonment could not be given.

June 15th received amended log from Standard Oil Co., which omitted statement on former log that the sand logged from 2530′ to 2535′ "acted like water sand."

June 25th, referred matter of discrepancies in logs to State Oil and Gas Supervisor.

June 28th, State Oil and Gas Supervisor requested explanation of San Francisco office of Standard Oil Company.

June 28th, received letter from Standard Oil Co. stating that field superintendent thought the driller was mistaken in logging the sand as a water sand. Letter also requested an approval of the abandonment, inferring that the plug was not necessary.

August 9th, 1917, received copy of letter from field superintendent to W. O. Todd, both of the Standard Oil Co., stating that on April 29th the field superintendent had placed a burnt wire line bridge at 2530′ and a cement plug thereon at 2490′.

September 4th, State Oil and Gas Supervisor wrote the San Francisco office of Standard Oil Company stating:

"Careful consideration of the above-mentioned records leave us the choice of three propositions:

First—Either the plug was not inserted because it was not necessary; or

Second—The plug was put in and not reported, notwithstanding the fact that such a piece of work would require enough time to certainly be noted in any complete report of operations.

Third—Supplemental reports, contradicting previous records or conclusions have been filed without being substantiated.

This department can not assume to choose between such a wide variation of statements in making any report as to the condition of the well."

No further copy in Bakersfield files.

Well No. 1, abandon. DD-466.

Approved work and specified additional plugging.

April 11th, waived additional plugging on receipt of information from the company that certain sands had been tested and found barren.

May 14th, replied to report of May 4th, describing work done in abandoning, stating that work as outlined would satisfactorily protect oil formations.

SECTION 25.

Provident Oil & Mining Co.

Well No. 1, abandon. DD-443.

February 26th, recommended cleaning to bottom and plugging for possible bottom water.

May 4th, received affidavit from J. A. Korst stating no bottom water encountered in drilling well.

May 10th, letter to State Oil and Gas Supervisor reporting conversation with Mr. Korst, in which he retraced the statements in his affidavit as to the time he worked on the well and as to whether or not bottom water was encountered in the well.

Well No. 2, abandon. DD-444.

February 26th, approved and recommended additional work.

March 30th, Mr. McLennan of Bakersfield informed San Francisco office of the Bureau that the well was being abandoned.

March 30th, telegram from State Oil and Gas Supervisor asking investigation.

March 30th, reply to State Oil and Gas Supervisor stated that inspector had visited the well each working day since work began to note progress.

SECTION 27.

Standard Oil Co.

Well No. 2, shut-off. D-423.

Reported witnessing test showing shut-off effective at shoe, but withholding approval on account of failure to secure approval of the deepening and casing off of oil sands behind 8¼" pipe.

Well No. 2, redrill. DD-450.

Approved proposal to plug bottom of hole and test oil sands cased off behind 8¼" pipe.

Well No. 2, abandon. DD-472.

Approved proposal to abandon on account of collapsed pipe. Recommended minor changes in location of plugs.

May 31st, approved abandonment as described in subsequent report.

Well No. 3, redrill. DD-432.

Approved proposal to move rig 75′ and drill. No oil penetrated at first location. Depth 2026′.

Well No. 3, shut-off. D-437.

Reported witnessing bailing test of shut-off. Test indeterminate account of oil in pipe. Passed for a production test.

SECTION 35.

Standard Oil Co.
  Well No. 2, "State," abandon. DD-460.
    Approved proposal specifying certain additional plugging.
    March 31st, letter authorizing shooting and plugging at the point specified.
    May 14th, approved abandonment as outlined in report of company dated May 4th.
  Well No. 3, "State," redrill. DD-468.
    Approved proposal to cut out string of casing, above specified depth.

SECTION 36.

Kern River Drillers Oil Co.
  Well No. 3, redrill. DD-433.
    Approved proposal to make new shut-off with $8\frac{1}{4}''$ casing 14′ deeper.

T. 28 S., R. 28 E., M. D. B. & M.

SECTION 19.

Traffic Oil Co.
  Well No. 20-A, redrill. DD-260.
    Approved proposal to redrill oil string.
  Well No. 38, drill. DD-474
    Approving proposal as outlined.

Traders Oil Co.
  Well No. 52, redrill. DD-218.
    Approved proposal to redrill oil string providing water is properly shut off.

Requested logs.
  Well No. 64, drill. DD-407.
    Approving proposed point of shut-off.

Traffic Oil Co.
  Well No. 38, shut-off. D-438.
    Sand heaving, passed for production test.

SECTION 20.

Boston Petroleum Co.
  Well No. 12, shut-off. D-353.
    Reported witnessing satisfactory test.
  Well No. 12, redrill. DD-409.
    Approved proposal to plug bottom with cement to shut off bottom water.
  Well No. 12, shut-off. D-432.
    Reported witnessing production test showing bottom water satisfactorily plugged off.
  Well No. 16, drill. DD-493.
    Approved proposal as outlined.
  Well No. 17, drill. DD-494.
    Approved proposal as outlined.

Yellowstone Oil Co.
  Well No. 6, redrill. DD-461.
    Approved proposal to redrill oil string.
  Well No. 9, drill. DD-462.
    Approved proposal to redrill as outlined.
  Well No. 9, shut-off. D-431.
    Reported witnessing satisfactory test of shut-off.
  Well No. 10, drill. DD-483.
    Approved proposal as outlined.
  Well No. 10, shut-off. D-435.
    Reported witnessing satisfactory test.

SECTION 28.

Bankers Oil Co.
Well No. 36, drill. DD-401.
Authorized drilling with one string of pipe if no top water was encountered.
Well No. 37, drill. DD-410.
Authorized drilling with one string of pipe if no top water was encountered.

SECTION 29.

Virginia Oil Co.
Well No. 5, deepen. DD-498.
Authorized deepening from 900′ to 980′.
Well No. 12, deepen. DD-476.
Approved deepening from 940′ to 980′ on condition that bottom water would be shut off if encountered.
Well No. 16, redrill. DD-477.
Proposal as outlined approved.
Well No. 21, deepen. DD-454.
Proposal approved as outlined.
Well No. 22, deepen. DD-455.
Proposal approved as outlined.
Well No. 23, deepen. DD-456.
Proposal approved as outlined.
Well No. 24, deepen. DD-457.
Proposal approved as outlined.

SECTION 30.

Associated Oil Co.
Well No. 9-A, G. & W., shut-off. D-392.
Witnessed and approved.
Well No. 10-A, G. & W., shut-off. D-393.
Witnessed and approved.
Well No. 11-A, G. & W., shut-off. D-358.
Witnessed and approved.
Well No. 11-A, G. & W., redrill. DD-423.
Approving proposal to plug for bottom water.
Well No. 12-A, G. & W., shut-off. D-283.
Witnessed and approved.
Well No. 14-A, G. & W., shut-off. D-282.
Witnessed and approved.
Well No. 15-A, G. & W., shut-off. D-294.
Witnessed and approved.
Well No. 16-A, G. & W., shut-off. D-326.
Witnessed and approved.
Well No. 17-A, G. & W., shut-off. D-332.
Witnessed and approved.
Well No. 18-A, G. & W., shut-off. D-391.
Witnessed and approved.
Well No. 19-A, G. & W., shut-off. D-369.
Witnessed but rejected. Water in hole.
Well No. 19-A, G. & W., shut-off. D-397.
Witnessed and approved.
Well No. 20-A, G. & W., shut-off. D-284.
Witnessed and approved.
Well No. 21-A, G. & W., shut-off. D-311.
Witnessed and approved.
Well No. 22-A, G. & W., shut-off. D-312.
Witnessed and approved.

Associated Oil Co.
  Well No. 25-A, G. & W., shut-off. D-331.
    Witnessed and approved.
  Well No. 26-A, G. & W., shut-off. D-346.
    Witnessed and approved.
  Well No. 27-A, H. & W., shut-off. D-350.
    Witnessed and approved.
  Well No. 5, Luck, drill. DD-398.
  Well No. 5, Luck, shut-off. D-413.
  Well No. 9, Luck, shut-off. D-402.
  Well No. 10, Luck, shut-off. D-400.
  Well No. 11, Luck, shut-off. D-403.
  Well No. 11, Luck, redrill. DD-411.
  Well No. 12, Luck, shut-off. D-404.
  Well No. 12, Luck, redrill. DD-417.
  Well No. 16, Luck, shut-off. D-396.
  Well No. 16, Luck, redrill. DD-424.
  Well No. 17, Luck, redrill. DD-469.
  Well No. 17, Luck, drill. DD-496.
  Well No. 18, Luck, shut-off. D-399.
  Well No. 18, Luck, redrill. DD-442.
  Well No. 19, Luck, shut-off. D-411.
  Well No. 20, Luck, shut-off. D-418.
  Well No. 20, Luck, shut-off. D-419.
  Well No. 24, Luck, shut-off. D-394.
  Well No. 24, Luck, redrill. DD-418.
  Well No. 25, Luck, shut-off. D-408.
  Well No. 26, Luck, shut-off. D-405.
  Well No. 27, Luck, shut-off. D-406.
  Well No. 28, Luck, shut-off. D-414.
Traffic Oil Co.
  Well No. 4, drill.
    Withheld approval pending receipt of logs.
  Well No. 4, shut-off. D-420.
    Withheld approval on account of failure to furnish logs
  Well No. 4, drill. DD-439.
    Issued on receipt of logs. Approved proposal.
  Well No. 4, shut-off. D-422.
    Issued on receipt of logs. Approved proposal.
  Well No. 5, begin drilling. DD-499.
  Well No. 8, Euclid, shut-off. D-337.
  Well No. 9, shut-off. D-313.
Frank May.
  Well No. 6, shut-off. D-401.
Bald Eagle Oil Co.
  Well No. 13-A, shut-off. D-267.

SECTION 31.

Associated Oil Co.
  Well No. 4. Sycamore, redrill. DD-215.
  Well No. 10. Sycamore, redrill. DD-427.
  Well No. 11, Sycamore, redrill. DD-395.
  Well No. 12, Sycamore, redrill. DD-428.
  Well No. 13, Sycamore, shut-off. D-268.
  Well No. 14, Sycamore, shut-off. D-269.
  Well No. 15. Sycamore, shut-off. D-257.
  Well No. 16, Sycamore, shut-off. D-258.
  Well No. 17, Sycamore, shut-off. D-250.
  Well No. 18, Sycamore, shut-off. D-270.

Associated Oil Co.
  Well No. 34, Sterling, redrill and deepen. DD-214.
  Well No. 5, Queen Esther, shut-off. D-409.
  Well No. 26-A, G. & W., shut-off. D-346.
  Well No. 4, H. & F., redrill. DD-459.
  Well No. 5, Hanford-Fresno, shut-off. D-301.
  Well No. 6, Hanford-Fresno, shut-off. D-307.

Peerless Oil Co.
  Well No. 3, locate and shut off water. DD-266.
  Well No. 5, redrill. DD-451.
  Well No. 14, redrill. DD-464.
  Well No. 14, abandon. DD-465.
  Well No. 26, shut-off. D-362.
  Well No. 28, redrill. DD-397.
  Well No. 33, redrill. DD-479.
  Well No. 41, redrill. DD-471.
  Well No. 41, redrill. DD-490.
  Well No. 42, shut-off. D-181.
  Well No. 42, redrill to shut-off water. DD-412.
  Well No. 43, shut-off. D-182.
  Well No. 43, redrill. DD-222.
  Well No. 49, shut-off. D-342.
  Well No. 51, redrill. DD-446.
  Well No. 53, shut-off. D-183.
  Well No. 54, redrill. DD-233.
  Well No. 54, abandon. DD-405.
  Well No. 67, shut-off. D-184.
  Well No. 70, shut-off. D-256.
  Well No. 71, drill. DD-408.
  Well No. 71, shut-off. D-417.
  Well No. 72, drill. DD-484.

Sovereign Oil Co.
  Well No. 9, redrill. DD-232.
  Well No. 11, drill. DD-478.

Vesta Oil Co.
  Well No. 12, redrill. DD-254.
  Well No. 12, redrill and deepen. DD-473.
  Well No. 14, redrill. DD-482.

Calloma Oil Co.
  Well No. 7, shut-off. D-314.

SECTION 32.

Associated Oil Co.
  Well No. 4, Omar, redrill. DD-253.

SECTION 33.

Kern River Oilfields Co. Ltd.
  Well No. 10, redrill. DD-228.
  Well No. 10, shut-off. D-276.
  Well No. 11-B, abandon. DD-430.

T. 29 S., R. 28 E., M. D. B. & M.

SECTION 2.

Petroleum Development Co.
  Well No. 16, drill. DD-491.

SECTION 3.

J. E. Gray Estate.
  Well No. 25, shut-off. D-244.
    Witnessed. Approved.
  Well No. 26, shut-off. D-306.
  Well No. 27, drill. DD-440.
  Well No. 27, shut-off. D-425.
  Well No. 28, drill. DD-458.
  Well No. 28, shut-off. D-428.
  Well No. 29, drill. DD-486.
  Well No. 29, shut-off. D-436.

SECTION 4.

Clampitt Oil Co.
  Well No. 17, drill. DD-402.
  Well No. 17, shut-off. D-416.
  Well No. 18, drill. DD-403.
  Well No. 18, shut-off. D-424.
  Well No. 19, drill. DD-404.

Kern Four Oil Co.
  Well No. 2, B. J., redrill. DD-390.
  Well No. 6, B. J., redrill and deepen. DD-394.

East Puente Oil Co.
  Well No. 1, redrill. DD-488.
  Well No. 1, abandon. DD-497.

Kern River Oil Co.
  Well No. 8, redrill. DD-480.
  Well No. 9, B. J., redrill. DD-431.
  Well No. 12, B. J., redrill. DD-413.

Petroleum Development Co.
  Well No. 28, redrill. DD-445.
    See complaint No. 17.
  Well No. 28, shut-off. D-427.
    See complaint No. 17.

Alma Oil Co.
  Well No. 2., Jr., redrill. DD-447.
    See complaint No. 17.

Apollo Oil Co.
  Well No. 1, redrill. DD-434.

SECTION 5.

Standard Oil Co.
  Well No. 8 (M. C. No. 1), redrill. DD-492.
  Well No. 10 (M. C. No. 1), redrill. DD-429.
  Well No. 13 (M. C. No. 1), abandon. DD-414.
  Well No. 16 (M. C. No. 1), abandon. DD-393.
  Well No. 24 (M. C. No. 1), redrill. DD-435.
  Well No. 24 (M. C. No. 1), shut-off. D-430.
  Well No. 28 (M. C. No. 1), redrill. DD-485.
  Well No. 29 (M. C. No. 1), redrill. DD-437.
  Well No. 30 (M. C. No. 1), abandon. DD-421.
  Well No. 38 (M. C. No. 1), redrill. DD-436.
  Well No. 42 (M. C. No. 1), redrill. DD-438.
  Well No. 42 (M. C. No. 1), shut-off. D-426.
  Well No. 51 (M. C. No. 1), redrill and abandon DD-415.
  Well No. 51 (M. C. No. 1), shut-off. D-433.
  Well No. 68 (M. C. No. 1), drill. DD-463.
  Well No. 68 (M. C. No. 1), shut-off. D-429.

Associated Oil Co.
  Well No. 5, S. J., redrill. DD-226.
  Well No. 5, S. J., shut-off. D-407.
  Well No. 5, S. J., redrill. DD-470.
  Well No. 5, S. J., shut-off. D-434.
  Well No. 40, S. J., shut-off. D-295.
  Well No. 41, S. J., shut-off. D-271.
  Well No. 42, S. J., shut-off. D-248.

Amaurot Oil Co.
  Well No. 2, abandon. DD-422.
  Well No. 2, redrill. DD-425.
  Well No. 4, redrill. DD-453.

Del Rey Oil Co.
  Well No. 1, West, redrill. DD-416.
  Well No. 6, redrill and deepen. DD-487.
  Well No. 9, redrill. DD-269.
  Well No. 9, shut-off. D-410.
  Well No. 10, East, redrill and deepen. DD-396.

SECTION 6.

Calex Oil Co.
  Well Nos. 1 and 2, redrill and deepen. Notice 9/25/16.

Enos Oil Co.
  Well No. 14, shut-off. D-249.
  Well No. 15. Redrill. DD-285.
  Well No. 15, shut-off. D-395.
  Well No. 18, redrill. DD-392.

SECTION 8.

Prairie Oil Co.
  Well No. 3, shut-off. D-246.
  Well No. 3, redrill. DD-495.

Harris and Stevens Corp.
  Well No. 1, Volcan, redrill. DD-448.
  Well No. 6, Ohio Crude, redrill. DD-449.

Frank May Oil Co.
  Well No. 1, Golden Rod, redrill. DD-441.
  Well No. 6, drill. DD-391.

Montgomery and Cole.
  Well No. 4, shut-off. D-340.

Tar & McComb, Inc.
  Well No. 5, Volcan, redrill. DD-481.

SECTION 9.

Petroleum Development Co.
  Well No. 4, shut-off. D-341.
  Well No. 5, shut-off. D-251.
  Well No. 6, shut-off. D-398.
  Well No. 7, drill. DD-420.
  Well No. 7, shut-off. D-421.
  Well No. 8, shut-off. D-299.
  Well No. 9, drill. DD-406.
  Well No. 9, shut-off. D-415.
  Well No. 11, drill. DD-400.
  Well No. 11, shut-off. D-412.

Junction Oil Co.
Well No. 5, old well, abandon. DD-262.
Well No. 6, redrill. DD-399.
Well No. 7, redrill. DD-224.
Well No. 7, abandon. DD-236.
Well No. 7, shut-off. D-390.
Well No. 9, abandon. DD-221.
Well No. 9, shut-off. D-317.

May Oil Co.
Well No. 9, redrill. DD-426.

Capital City Oil Co.
Well No. 3, redrill. DD-452.

T. 29 S., R. 20 E., M. D. B. & M.

SECTION 36.

Shear Petroleum Co.
Well No. 12, shut-off. D-265.
Reported satisfactory test of shut-off based on information furnished by the company.

T. 29 S., R. 21 E., M. D. B. & M.

SECTION 2.

General Petroleum Co.
Well No. 32-A, shut-off. A-175.
Reported witnessing production test showing very little water in the oil.
Well No. 54-A, shut-off. D-585.
Reported satisfactory test of shut-off based on information furnished by the company.
Well No. 55, shut-off. D-354.
Reported satisfactory test of shut-off based on information furnished by the company.
Well No. 97, drill. DD-619.
Approved proposal as outlined.
Well No. 97, shut-off. D-850.
Reported witnessing satisfactory test of shut-off.
Well No. 98, drill. DD-693.
Approved proposal as outlined.
Well No. 99, drill. DD-719.
Approved proposal as outlined.
Well No. 122, drill. DD-718.
Approved proposal as outlined.
Well No. 123, drill. DD-717.
Approved proposal as outlined.
Well No. 123, shut-off. D-915.
Reported witnessing satisfactory test of shut-off.
Well No. 86 (new No. 124), drill. DD-618.
Approved proposal as outlined.
Well No. 124, shut-off. D-857.
Reported witnessing satisfactory test of shut-off.
Well No. 125, drill. DD-716.
Approved proposal as outlined.
Well No. 126, drill. DD-715.
Approved proposal as outlined.
Well No. 127, drill. DD-721.
Approved proposal as outlined.

SECTION 3.

General Petroleum Corporation.

Well No. 14-A, shut-off. A-205.

Reported satisfactory test of shut-off, based on information furnished by the company.

Well No. 15, shut-off. D-361.

Reported satisfactory test of shut-off based on information furnished by the Company.

Well No. 15, abandon. DD-370.

Authorized proposed abandonment but specified below 12½″ instead of in same.

Well No. 18-A, shut-off. D-536.

Reported witnessing satisfactory test of shut-off.

Well No. 20-A, shut-off. D-371.

Reported witnessing satisfactory test of shut-off.

Well No. 21, drill. DD-315.

Approved proposal as outlined.

Well No. 21, shut-off. D-777.

Reported witnessing satisfactory test of shut-off.

Well No. 25, drill. DD-620.

Approved proposal as outlined.

Well No. 30, drill. DD-316.

Approved proposal as outlined.

Well No. 30, shut-off. D-820.

Reported satisfactory test of shut-off based on information furnished by the company.

Well No. 45-A, shut-off. A-174.

Reported witnessing production test showing practically no water.

Marina Oil Co.

Well No. 1, shut-off. D-596.

Reported witnessing satisfactory test of top water shut-off.

Well No. 2, shut-off. D-615.

Reported witnessing satisfactory test of shut-off.

Well No. 3, shut-off. D-629.

Reported satisfactory test of shut-off based on observation of inspector and letter from company.

Well No. 3, shut-off. D-883.

Reported witnessing satisfactory test of shut-off.

Well No. 4, drill. DD-508.

Authorized proposal as outlined.

Well No. 4, shut-off. D-687.

Reported satisfactory test of shut-off based on letter from the company.

Well No. 4, redrill. DD-701.

Approved proposal as outlined.

Well No. 5, drill. DD-617.

Approved proposal as outlined.

Well No. 6, drill. DD-713.

Authorized as proposed.

Well No. 9, drill. DD-509.

Approved as proposed.

Well No. 9, shut-off. D-637.

Reported witnessing satisfactory test of shut-off.

Well No. 10, drill. DD-510.

Authorized as proposed.

Well No. 10, shut-off. D-660.

Reported witnessing test of shut-off and passing same for production test on account of heaving sand.

Well No. 11, drill. DD-556.

Authorized as proposed.

Marina Oil Co.
Well No. 11, shut-off. D-749.
Reported witnessing satisfactory test of shut-off.
Well No. 12, shut-off. DD-576.
Authorized as proposed.
Well No. 12, shut-off. D-836.
Reported witnessing satisfactory test of shut-off.
Well No. 13, drill. DD-703.
Approved proposal as outlined.
Well No. 17, drill. DD-511.
Approved proposal as outlined.
Well No. 17, shut-off. D-698.
Reported satisfactory test of shut-off based on observations of inspector and letter from company.
Well No. 18, drill. DD-557.
Approved proposal as outlined.
Well No. 18, shut-off. D-715.
Reported failure of shut-off based on letter from the company and authorized cementing second string deeper.
Well No. 18. Shut-off. D-757.
Reported witnessing satisfactory test of shut-off.
Well No. 19, drill. DD-577.
Approved proposal as outlined.
Well No. 19, shut-off. D-802.
Reported witnessing test of shut-off and passing for a production test.
Well No. 20, drill. DD-705.
Approved proposal as outlined.
Well No. 20, shut-off. D-835.
Reported witnessing satisfactory test of shut-off.
Well No. 21, drill. DD-578.
Approved proposal as outlined.
Well No. 21, shut-off. D-797.
Reported witnessing test of shut-off and passing well for production test.
Well No. 22, drill. DD-579.
Approved proposal as outlined.
Well No. 22, shut-off. D-822.
Reported witnessing satisfactory test.
Well No. 23, drill. DD-706.
Approved as proposed.
Well No. 28. drill. DD-615.
Approved as outlined.
Well No. 28, shut-off. D-801.
Reported witnessing satisfactory test of shut-off.
Well No. 29, drill, DD-614.
Approved proposal as outlined.
Well No. 29, shut-off. D-758.
Reported witnessing satisfactory test of shut-off.
Well No. 30, drill. DD-707.
Approved proposal as outlined.
Well No. 35, drill. DD-616.
Approved proposal as outlined.
Well No. 36, drill. DD-708.
Approved proposal as outlined.
Well No. 42, drill. DD-712.
Approved proposal as outlined.
Well No. 43, drill. DD-775.
Approved as proposed.
Well No. 49, drill. DD-776.
Approved as proposed.

Marina Oil Co.
Well No. 50, drill. DD-777.
Approved as proposed.
Well No. 51, drill. DD-778.
Approved as proposed.
Well No. 55, drill. DD-845.
Approved proposal as outlined.

SECTION 8.

Standard Oil Co.
Well No. 1, M. & L., No. 2, drill. DD-542.
Approved proposal and required a test of shut-off before drilling through any oil encountered above the proposed depth of shut-off.

SECTION 11.

General Petroleum Co.
Well No. 3-B (now No. 14-B), redrill. DD-532.
Approved proposal as outlined.
Well No. 3-B (now No. 14-B), shut-off. D-712.
Reported witnessing test of shut-off of old string of 10″ showing water not shut off. Asked for further proposal.
Well No. 9-B (now No. 7-B), shut-off. D-387.
Reported witnessing test showing small amount of sulphur water probably from formations below the shut-off. Shut-off reported satisfactory.
Well No. 9-B (now No. 7-B), shut-off. D-650.
Reported witnessing test of second shut-off showing small amount of water. Recommended prospecting ahead.
Well No. 11-B, drill. DD-694.
Approved proposal as outlined.
Well No. 11-B, shut-off. D-812.
Reported witnessing satisfactory test of shut-off.

SECTION 25.

Sunbeam Oil Co.
Well No. 1, drill. DD-353.
Approved proposal as outlined.

SECTION 26.

United Western Oil Co.
Well, Arcadia No. 1, test old well. DD-234.
Approved proposal to clean out and pump.
United Western Consolidated Oil Co.
Well No. 2, drill. DD-645.
Approved proposal as outlined.
Well No. 2, shut-off. D-804.
Reported witnessing test of shut-off showing rise in water line of two feet per hour. Recommended further test.
Well No. 2, shut-off. D-808.
Reported witnessing test of shut-off. Passed for production test on account of sand in pipe.
Suncrest Oil Co.
Well No. 1, shut-off. D-685.
Reported witnessing test showing 10″ casing had failed to shut off water.
Well No. 1, shut-off. D-796.
Reported witnessing test of shut-off showing that 8¼″ casing had probably not shut off water. Recommended further test.

Suncrest Oil Co.

Well No. 1, shut-off. D-889.

Reported witnessing test of shut-off after recementing the 8¼″ casing, showing only slight rise in water level, but recommended further tests on account of the fact that sand in the pipe prevented a conclusive test.

NOTE.—This well was put to producing and the company reported it producing clear and ready for test. Before the date set for test it was reported that water had broken in. Since that time the well is reported to have produced water intermittently. The source of the water has not yet been determined.

H. S. Williams Oil Co.

Well No. 9, shut-off. D-277.

Reported witnessing test of shut-off. Sand heaving prevented conclusive test.

Well No. 9, cement off lower sand. DD-247.

Approved proposal to plug back with cement to shut off sulphur water found below the 10″ casing.

Well No. 9, redrill. DD-545.

Approved proposal to make lower shut-off at 1245′ and advised making same at 1350′.

Well No. 9, shut-off. D-696.

Reported witnessing test of lower shut-off showing same unsatisfactory.

Well No. 9, shut-off. D-753.

Reported witnessing test of shut-off after recementing. Test inconclusive on account of having sand.

Well No. 9. deepen. DD-700.

Approved proposal to redrill and make deeper shut-off.

Well No. 17, shut-off. D-300.

Reported witnessing satisfactory test of shut-off by 10″ casing.

Well No. 17, shut-off. D-338.

Reported witnessing satisfactory test of shut-off by 8¼″ casing.

Well No. 17, deepen. DD-581.

Approved proposal to deepen and replace perforated with screen pipe.

Well No. 19, drill. DD-314.

Approved proposal as outlined.

Well No. 19, shut-off. D-605.

Reported witnessing test. Passed for production test on account of heaving sand.

Well No. 20, abandon. DD-347.

Approved proposal to plug off bottom water and abandon. Required tests of plugging.

Well No. 50, drill. DD-613.

Approved proposal as outlined.

Well No. 50, shut-off. D-881.

Reported witnessing satisfactory test of shut-off.

Well No. 51, shut-off. D-359.

Reported witnessing test of shut-off. Passed for production test on account of heaving sand.

Well No. 53, shut-off. D-832.

Reported witnessing test of shut-off. Passed for production test on account of heaving sand.

SECTION 27.

Standard Oil Co.

Well No. 2, M. P., shut-off. D-633.

Reported witnessing test of shut-off. Test inconclusive on account of crew having run bailer before arrival of inspector.

SECTION 36.

West Penn Co. Incorporated.

Well No. 1, abandon. DD-235.

Approved proposal and specified extra plugging.

West Penn Co. Incorporated.

Well No. 1, drill. DD-306.

Approved proposal to drill new No. 1.

Well No. 2 (now No. 1), shut-off. D-587.

Reported witnessing test showing constant amount of sulphur water coming in.

Well No. 2 (now No. 1), shut-off. D-763.

Reported witnessing satisfactory test of shut-off.

Well No. 3 (now No. 2), drill. DD-519.

Approved proposal as outlined.

Standard Oil Co.

Well No. 1, McPhee, shut-off. D-280.

Reported satisfactory test of shut-off based on verbal information from company.

Well No. 1, shut-off. D-363.

Reported witnessing satisfactory test. Letter October 14th requesting company to furnish report of formations penetrated between the two points of shut-off.

Well No. 1, McPhee, redrill. DD-595.

Rejected proposal to redrill pending receipt of log and history.

Well No. 1, McPhee, redrill. DD-598.

Approved proposal to redrill as above and stated that approval should have been given in DD-595 as information requested had at that time been furnished.

Well No. 2, drill. DD-371.

Approved proposal as outlined.

Well No. 2, McPhee, shut-off. D-771.

Reported witnessing satisfactory test.

Well No. 3, McPhee, drill. DD-543.

Approved proposal as outlined.

T. 29 S., R. 22 E., M. D. B. & M.

SECTION 18.

Union Oil Co.

Well No. 1, Coyote, abandon. DD-264.

Approved proposal to abandon as outlined.

SECTION 32.

Barnsdale, Drake & Yancey.

Well No. 1, abandon. DD-731.

The proposal stated that there was no record of the well other than the total depth and the amount of various sizes of pipe charged to the well. The report specified plugging at certain depths based on the assumption that the well was identical with a well known as Globe Exploration Co. No. 1, of which a log was found in the file.

Well No. 1, shut-off. D-840.

Reported witnessing a test to determine advisability of modifying previous requirements, which substantiated belief that plugging should be done as specified.

Well No. 1, shut-off. D-929.

Reported witnessing test which showed that cement at top of plug (at 1666′) was set hard.

At the time of this test the crew was preparing to shoot the 6⅝″ casing. This work was held up by the inspector, who explained to the driller that it was particularly desired to leave conductor pipe to the top of the lower plug.

The inspector then took the driller to McKittrick to enable him to communicate with his employers, the Midway Supply Company.

It was later learned that the driller returned and fired the shot in spite of the warning. After some negotiations the Midway Supply Company cleaned out through the shot cavity and left it standing full of mud to prevent filling in with sand and to permit of access to the lower portion of the hole should future development demonstrate the necessity of additional plugging.

T. 29 S., R. 37 E., M. D. B. & M.

SECTION 27.

William Bosustow Co.

Well No. 1, abandon. DD-658.

Approved proposal as outlined. Letter received May 7, 1917, furnished report of the work and asked permission to cement into water well.

Reply May 9th stated the department had no objection to plan to make use of the water developed.

T. 30 S., R. 21 E., M. D. B. & M.

SECTION 11.

Jackson Oil Co.

Well No. 6, shut-off. D-279.

Reported satisfactory test of top and bottom water shut-off, based on report from superintendent.

Well No. 7, shut-off. D-264.

Reported satisfactory test based on report by superintendent.

Well No. 8, drill. DD-513.

Approved as proposed.

Well No. 8, shut-off. D-700.

Reported witnessing satisfactory test.

East Puente Oil Co.

Well No. 2 (Lease 2), redrill. DD-369.

Approved proposal to bridge in oil string below water string and perforate above bridge and force cement out into formation below water string in an effort to shut off top water.

Well No. 2 (Lease 2), redrill. DD-376.

Approved amended proposal to put cement in through 1¼″ pipe between the strings instead of through perforations. The work decreased the water from 8% to ½ of 1%.

Well No. 4 (Lease 2), shut-off. D-600.

Reported witnessing satisfactory test.

Well No. 5 (Lease 2), drill. DD-368.

Approved proposal as outlined.

Well No. 5, shut-off. D-772.

Reported witnessing satisfactory test.

Well No. 6, drill. DD-897.

Approved as proposed.

Well No. 7, drill. DD-913.

Approved as proposed.

Josephine Oil Co.

Well No. 1, abandon. DD-649.

Approved as proposed. Could not get water shut off. Did not penetrate oil. To be cemented to water well.

Well No. 2, drill. DD-646.

Approved as proposed.

Well No. 2, shut-off. D-844.

Reported witnessing test. Recommended further tests.

Well No. 2, shut-off. D-849.

Reported witnessing test showing failure of shut-off attempted with mud fluid behind 10″ casing at 844′.

Well No. 2, shut-off. D-910.

Reported witnessing satisfactory test of shut-off; 10″ casing cemented at 965′

Kern Trading & Oil Co.

Well No. 3, shut-off. D-510.

Reported witnessing satisfactory test.

Well No. 3, Foltz, shut-off. D-880.

Reported witnessing indeterminate test of plugging to exclude bottom water. Passed for production test on account of heaving sand.

Well No. 4, drill. DD-866.

Approved proposal as outlined.

SECTION 12.

Associated Oil Co.

Well No. 1, California Standard, abandon. DD-275.

Recommended cementing where 10″ cut and plugging up to bottom of 12½″ casing.

SECTION 13.

Berry and Keller Co.

Well No. 3, new, drill. Letter, 8/1/16.

Approved proposal specifying that shut-off be made uniform with those of adjoining wells.

Well No. 3, shut-off. D-290.

Reported satisfactory test of shut-off based on information submitted by the company.

Well No. 8, redrill. DD-541.

Recommended testing water string by using dye or by bridging under it and redrilling as proposed.

Well No. 8, shut-off. D-713.

Reported witnessing test showing water string to be tight.

Well No. 13, shut-off. D-242.

Reported test showing no leak in water string.

Well No. 15, redrill. DD-763.

Approved proposal to replace perforated with screen pipe.

Well No. 16, shut-off. D-370.

Reported witnessing satisfactory test.

Well No. 17, shut-off. D-542.

Reported witnessing satisfactory test.

Well No. 18, drill. DD-504.

Approved proposal as outlined.

Well No. 18, shut-off. D-614.

Reported witnessing satisfactory test.

Reward Oil Co.

Well No. 5, deepen and redrill. DD-243.

Approved proposal to deepen for submergence for air lift.

Well No. 33, redrill. DD-240.

Approved proposal to redrill oil string.

Well No. 42, drill. Letter 8/10/16.

Approved proposal specifying that shut-off be made uniform with those of adjoining wells.

Well No. 42, shut-off. D-384.

Reported witnessing satisfactory test. It was reported that after cementing the 10″ casing at 850′ with 40 sacks the 12½″ casing was freed and used to tamp in a bridge around the 10″ casing from 267′ to 248′. On this 39 sacks of cement were placed as the 12½″ was pulled, the idea being to keep water from a gas sand from 615′ to 755′ which it was desired to produce.

Associated Oil Co.

Well No. 15, Del Monte, redrill. DD-365.

Approved proposal to replace oil string and use screen pipe.

Well No. 32, Del Monte, redrill. DD-366.

Approved proposal to pull oil string and replace with screen pipe.

Kern Trading & Oil Co.
Well No. 26, redrill. DD-600.
Approved proposal as outlined.

Jewett Oil Co.
Well No. 15, drill. Letter, 12/20/16.
Approved proposal and requested logs.
Well No. 15, shut-off. D-716.
Reported witnessing test. Passed for production test on account of heaving sand.
Well No. 15, redrill. DD-871.
Approved proposal to plug off bottom sands and perforate water string.

Section 14.

San Francisco & McKittrick Oil Co.
Well No. 3, abandon. DD-355.
Approved proposal as outlined.
Well No. 3-A, drill. DD-540.
Approved proposal as outlined.
Well No. 3-A, shut-off. D-653.
Reported witnessing satisfactory test.
Well No. 4, old, abandon. DD-322.
Approved proposal specifying that plug be placed in the formation below the water string as well as in the shoe of same.
Well No. 4, new (now 4-A), drill. DD-323.
Approved as proposed.
Well No. 4½ (now 4-A), shut-off. D-540.
Reported witnessing satisfactory test.
Well No. 9, deepen. DD-230.
Approved as proposed.
Well No. 12, deepen. DD-669.
Approved as proposed.
Well No. 15, deepen. DD-880.
Approved as proposed.
Well No. 16, deepen. DD-790.
Approved as proposed.

T. 30 S., R. 22 E., M. D. B. & M.

Section 6.

Standard Oil Co.
Well No. 1, Sea B, shut-off. D-646.
Reported witnessing satisfactory test.
Well No. 1, Sea B, redrill. DD-594.
Approved proposal to redrill and cement water string deeper.
Well No. 1, Sea B, shut-off. D-815.
Reported witnessing test showing some water coming in. Recommended further bailing.
Well No. 1, Sea B, shut-off. D-856.
Reported witnessing satisfactory test.
Well No. 2, Sea B, shut-off. D-647.
Reported witnessing satisfactory test.
Well No. 3, McKittrick, drill. DD-307.
Approved proposal.
Well No. 3, shut-off. D-573.
Reported witnessing satisfactory test.
Well No. 3, McKittrick, shut-off. D-622.
Reported witnessing satisfactory test.
Well No. 3, shut-off. D-761.
Reported witnessing satisfactory test. Withheld decision as to point of landing.

Standard Oil Co.
  Well No. 4, McKittrick, shut-off. D-511.
    Reported witnessing satisfactory test.
  Well No. 4, McKittrick, redrill. DD-630.
    Approved proposal to plug bottom and if necessary to cement new water string. Since the close of the year the well was abandoned for lack of production.
  Well No. 5, McKittrick, drill. DD-562.
    Approved as proposed.
  Well No. 5, shut-off. D-833.
    Reported witnessing satisfactory test.
  Well No. 6, McKittrick, shut-off. D-652.
    Reported witnessing satisfactory test.

Nevada County Oil Co.
  Well No. 3 (now No. 43), redrill. DD-319.
    Approved as proposed.
  Well No. 43, redrill. DD-878.
    Approved proposal to plug bottom of hole and test upper sands.
  Well No. 44, abandon. DD-879.
    Approved abandonment. Specified certain plugging.
  Well No. 45, redrill. DD-320.
    Approved proposal with recommendations.
  Well No. 47, drill. DD-354.
    Approved as proposed.
  Well No. 47, shut-off. D-697.
    Reported witnessing satisfactory test.
  Well No. 48, shut-off. D-787.
    Reported witnessing test. Passed for production test on account of heaving formation.

Pittsburg Oil & Gas Co.
  Well No. 1, shut-off. D-351.
    Reported satisfactory test.
  Well No. 1, shut-off. D-551.
    Reported witnessing satisfactory test.
  Well No. 1, deepen and cement. DD-363.
    Approved proposal to cement deeper.

Nacirema Oil Co.
  Well No. 1, redrill. DD-520.
    Approved proposal to redrill oil string and determine casing record. No log had been preserved.
  Well No. 2, drill. DD-529.
    Approved as proposed.

SECTION 8.

Standard Oil Co.
  Well No. 2, shut-off. D-327.
    Reported satisfactory test.
  Well No. 2, McKittrick, shut-off. D-597.
    Reported witnessing and approving test showing only small amount of water coming in.
  Well No. 2, shut-off. D-839.
    Reported witnessing test showing no water coming into hole. Gave notice that the redrilling and resulting depth of cementing were not authorized.

SECTION 10.

Midway Supply Co.
  Well No. 1, Barnsdale, Yancy & Drake, abandon. DD-729.
    Approved proposal specifying that hole be filled from bottom to top with clay or surface formation.
    Description of the work received May 4th from Midway Supply Co. indicates specifications were not followed.

SECTION 16.

Standard Oil Co.

Well No. 1, Spreckels, drill. DD-536.

Approved proposal. Required notification of tests of sands below 450′.

Well No. 1, Spreckels, shut-off. D-762.

Reported witnessing satisfactory test of 12½″ casing cemented at 1090′. The department was not called to witness test of 15½″ at 440′ as required in DD-536.

Well No. 1, Spreckels, shut-off. D-882.

Reported witnessing satisfactory test. No approval had been given for the work tested.

Well No. 2, Spreckels, drill. DD-537.

Approved.

Well No. 2, Spreckels, shut-off. D-916.

Reported witnessing satisfactory test, but gave no clearance on account of shut-off having been made lower than proposed.

SECTION 19.

Associated Oil Co.

Well No. 4, W. D., abandon. DD-377.

Approved. Requested log.

SECTION 29.

Midway Royal Petroleum Co.

Well No. 3, drill. DD-691.

Approved.

SECTION 34.

Doheny Pacific Petroleum Co.

Well No. 1, Abandon. DD-804.

On May 25th a written proposal to abandon the well was received. It stated: "The proposed work is as follows: To withdraw 5⅝″ casing set by our company and leave well in condition received, as per our contract with original holders." It was understood that the work referred to had been done the previous month.

The above report recommended "that this department be called upon to witness a bailing test to determine: 1. Whether or not there is water in the hole. 2. The gravity of the oil."

The company then furnished an original statement of the driller descriptive of the tests previously made, to which this department replied in part as follows: "The well is not in proper condition for this department to issue an approval on the work of abandonment that has been done. I trust that your Company and the parties from whom your Company leased the land will, in the near future, get together and lay before this department a proposal for abandoning the well properly."

A conference of the parties interested was held at the Taft office of the State Mining Bureau on August 28th, 1917, which resulted in a new proposal dated September 10th, 1917. This proposal was rejected in report No. P-4-680 dated September 13th, 1917, as the work proposed neglected to properly protect the lower portion of the hole. This report required cleaning the hole out to 1400′ and shooting to destroy sidetracked pipe, and certain plugging and tests above that depth. It was later modified and after the hole was cleaned out to 1320′ it was shot and plugged at that depth and then bailed for a test by the department. At this test the well showed a large amount of heavy oil and very little water.

It is thought likely that the well can be made into a profitable producer in its present condition.

Combined Oil Co.

Well No. 3, shut-off. D-703.

Witnessed satisfactory test.

Well No. 3, redrill. DD-801.

Approved.

T. 31 S., R. 22 E., M. D. B. & M.

SECTION 2.

J. E. O'Donnell Lease.
  Well No. 1, abandon. DD-225.
    Approved.

Doheny Pacific Petroleum Co.
  Well No. 1, J. E. O'Donnell, redrill. DD-263.
    Approved.
  Well No. 1, shut-off. D-335.
    Witnessed satisfactory test.

Associated Oil Co.
  Well No. 1, drill. Letter, 5/18/17.
  Well No. 1, shut-off. D-602.
    Witnessed satisfactory test.
  Well No. 2, drill. Letter, 5/18/17.
  Well No. 2, shut-off. D-754.
    Witnessed satisfactory test.

SECTION 3.

Doheny Pacific Petroleum Co.
  Well No. 2, shut-off. D-320.
    Witnessed satisfactory test.
  Well No. 2, abandon. DD-608.
    Approved.
  Well No. 3, abandon. DD-568.
    Approved.

J. E. O'Donnell Lease.
  Well No. 3, drill. Letter, 7/28/16.
    Approved.

SECTION 11.

Doheny Pacific Petroleum Co.
  Well No. 1, shut-off. D-729.
    Witnessed satisfactory test.
  Well No. 2, shut-off. D-595.
    Witnessed satisfactory test.

SECTION 12.

Correspondence re Wells of Midland Oilfields, Ltd.
    See Complaint No. 21.

SECTION 14.

Manley and McGinn.
  Well No. 6, shut-off. D-752.
    Witnessed satisfactory test.
  Well No. 7-C, drill. DD-699.
    Approved.
  Well No. 7-C, shut-off. D-827.
    Witnessed satisfactory test.
  Well No. 8, Cherokee, drill. DD-764.
    Approved.
  Well No. 8, shut-off. D-859.
    Witnessed inconclusive test.
  Well No. 8, shut-off. D-860.
    Witnessed satisfactory test.
  Well No. 9-C, Drill. DD-890.
    Approved.

Alberta Midway Oil Co.
  Well No. 7, shut-off. D-588.
    Witnessed satisfactory test.
  Well No. 8, shut-off. D-523.
    Witnessed satisfactory test.
  Well No. 9, shut-off. D-348.
    Witnessed satisfactory test.
  Well No. 11, shut-off. D-571.
    Witnessed satisfactory test.
  Well No. 12, shut-off. D-513.
    Witnessed satisfactory test.
  Well No. 13, shut-off. D-324.
    Witnessed satisfactory test.

Engineers Oil Co.
  Well No. 6, drill. Letter, 9/30/16.
    Approved.
  Well No. 6, shut-off. D-683.
    Witnessed satisfactory production test.
  Well No. 7, shut-off. D-879.
    Witnessed satisfactory test.
  Well No. 8, drill. DD-896.
    Approved.

General Petroleum Corporation.
  Well No. 4, Alberta Midway, deepen. DD-875.
    Approved.
  Well No. 11, redrill. DD-874.
    Approved. Recommended tests.

W. & S. Oil Co.
  No. 3 or C, abandon. DD-906.

Rejected on account of failure to furnish logs. Further proposals were received on July 11th and July 20th, which were rejected for lack of logs on July 25th.

On Aug. 14th, after receipt of the logs, specifications for the abandonment of the well were written.

On Sept. 14th, in answer to a supplementary notice, these specifications were modified.

Combined Oil Co.
  Well No. 1, redrill to 1500'. DD-257.
    Approved.
  Well No. 7, redrill. DD-317.
    Approved.

SECTION 15.

Midway Peerless Oil Co.
  Well No. 10, shut-off. D-288.
    Witnessed satisfactory test.
  Well No. 10, shut-off. D-319.
    Witnessed satisfactory test.
  Well No. 11, shut-off. D-328.
    Witnessed satisfactory test.
  Well No. 12, shut-off. D-376.
    Witnessed satisfactory test.
  Well No. 13, drill. DD-688.
    Approved.
  Well No. 13, shut-off. D-781.
    Witnessed satisfactory test.
  Well No. 14, drill. DD-900.
    Approved.

Midway Peerless Oil Co.
  Well No. 14, shut-off. D-846.
    Witnessed satisfactory test.
  Well No. 15, drill. DD-901.
    Approved.

General Petroleum Corporation.
  Well No. 7, redrill and deepen. DD-886.
    Approved.
  Well No. 15, redrill. DD-876.
    Approved.
  Well No. 19, redrill. DD-885.
    Approved.
  Well No. 35, redrill. DD-877.
    Approved.

Hondo Oil Co.
  Well No. 11, shut-off. D-247.
    Reported satisfactory test, not witnessed.
  Well No. 12, shut-off. D-532.
    Witnessed satisfactory test.
  Well No. 13, shut-off. D-682.
    Witnessed satisfactory test.
  Well No. 14, shut-off. D-645.
    Witnessed satisfactory test.
  Well No. 15, shut-off. D-719.
    Witnessed satisfactory test.

Potter Oil Co.
  Well No. 1-A, shut-off. D-730.
    Witnessed satisfactory test.
  Well No. 28, drill. DD-865.
    Approved.
  Well No. 28, shut-off. D-920.
    Witnessed satisfactory test.

SECTION 21.

State Consolidated Oil Co.
  Well No. 5, redrill. DD-609.
    Approved.

SECTION 23.

Rock Oil Co.
  Well No. 2, fluid level. D-906.
    Measured fluid level on account of Complaint No. 6.
  Well No. 4, fluid level. D-863.
    Measured fluid level on account of Complaint No. 6.

General Petroleum Corporation.
  Well No. 3, abandon. DD-567.
    Approved.

Kern Trading and Oil Co.
  Well No. 5, redrill. DD-853.
    Approved proposal to plug off oil sands at bottom and perforate water string to produce tar sands, cased off behind same in drilling.
  Well No. 13, redrill. DD-849.
    Approved proposal to plug off oil sands and perforate water string to produce so-called tar sands.
  Well No. 14, shut-off. D-516.
    Witnessed satisfactory test.

Tumbador Oil Co.
  Well No. 12, drill. Letter, 7/5/16.
  Well No. 12, shut-off. D-325.
    Witnessed satisfactory test.
  Well No. 13, shut-off. D-352.
    Witnessed satisfactory test.

SECTION 24.

Brookshire Oil Co.
  Well No. 7, fluid level. D-918.
    Determined on account of Complaint No. 12.

San Francisco Midway Oil Co.
  Well No. 2, redrill. DD-607.
    Approved proposal to do work on account of Complaint No. 6.

SECTION 25.

Visalia Midway Oil Co.
  Well No. 6, shut-off. D-634.
    Witnessed satisfactory test.
  Well No. 6, redrill. DD-628.
    Approved.
  Well No. 6, shut-off. D-793.
    Passed for production test.
  Well No. 7, shut-off. D-694.
    Witnessed satisfactory test.

Kern Trading and Oil Co.
  Well No. 1, abandon. DD-805.
    Approved.

SECTION 26.

C. C. M. O. Co.
  Well No. 16, shut-off. D-821.
    Witnessed inconclusive test.
  Well No. 16, shut-off. D-826.
    Witnessed satisfactory test.
  Well No. 17, drill. DD-735.
    Approved.
  Well No. 19, drill. DD-736.
    Approved with recommendations.
  Well No. 20, drill. DD-737.
    Approved with recommendations.
  Well No. 22, drill. DD-738.
    Approved with recommendations.

A. and J. Oil Co.
  Well No. 4, redrill. DD-792.
    Approved.

Reward Oil Co.
  Well No. 3, shut-off. D-670.
    Witnessed satisfactory test.
  Well No. 3, shut-off. D-786.
    Witnessed inconclusive test.

Pyramid Oil Co.
  Well No. 5, plug bottom. DD-640.
    Approved.
  Well No. 9, redrill. DD-512.
    Approved.
  Well No. 15, shut-off. D-524.
    Witnessed satisfactory test.
  Well No. 15, redrill. DD-641.
    Approved.

California Star Oil Co.
  Well No. 2, redrill. DD-724.
    Approved.
  Well No. 4, redrill. DD-309.
    Approved.
  Well No. 4, redrill. DD-806.
    Approved.
  Well No. 9, drill. DD-692.
    Approved.

El Camino Oil and Development Co.
  Well No. 8, redrill. DD-526.
  Well No. 10, redrill. DD-527.
  Well No. 17, shut-off. D-774.

General Petroleum Corporation.
  Well No. 12-A, redrill. DD-638.
  Well No. 13-A, shut-off. D-278.

Dabney Oil Co.
  Well No. 8, shut-off. D-677.
    Depth of shut-off 300′ lower than authorized, probably endangering upper oil zone.

SECTION 35.

Associated Oil Co.
  Well No. 45, plug off bottom water. DD-220.
  Well No. 45, abandon. DD-276.

SECTION 36.

American Oilfields Co.
  Well No. 46, redrill. DD-657.
  Well No. 55, redrill. DD-673.
    Work completed before receipt of proposal not approved.
  Well No. 55, redrill. DD-674.
    Requested further information.
  Well No. 55, deepen. DD-686.
    Recommended test of water string.
  Well No. 55, shut-off. D-806.
    Recommended further tests.
  Well No. 55, shut-off. D-838.
    Reported satisfactory test.
  Well No. 98, redrill. DD-223.
  Well No. 101, shut-off. D-635.
  Well No. 101, deepen. DD-744.

C. C. M. O. Co.
  Well No. 18, shut-off. D-809.
  Well No. 20, shut-off. D-627.
  Well No. 21, shut-off. D-665.
  Well No. 22, shut-off. D-640.
  Well No. 23, shut-off. D-623.
  Well No. 24, shut-off. D-675.
  Well No. 25, shut-off. D-680.
  Well No. 26, shut-off. D-651.
  Well No. 27, shut-off. D-890.
  Well No. 28, shut-off. D-720.
  Well No. 28, redrill, plug bottom. DD-888.
  Well No. 30, shut-off. D-834.
  Well No. 31, shut-off. D-744.
  Well No. 32, shut-off. D-878.
  Well No. 34, shut-off. D-848.
  Well No. 35, Shut-off. D-919.

T. 31 S., R. 23 E., M. D. B. & M.

SECTION 14.

Barnodon Oil Co.
Well No. 1, abandon. DD-714.

SECTION 19.

Union Oil Co.
Well No. 2, Midway Royal, shut-off. D-318.
Well No. 2, Midway Royal, shut-off. D-686.
Well No. 2, abandon. DD-761.
Well No. 3, shut-off. D-858.

Calidon Petroleum Syndicate.
Well No. 2, redrill and deepen. DD-237.
Well No. 2, shut-off. D-601.
Well No. 3, drill. DD-647.

SECTION 20.

Associated Oil Co.
Well No. 72, redrill. DD-582.
Well No. 72, shut-off. D-721.

SECTION 21.

Kern Trading and Oil Co.
Well No. 14, drill. DD-690.
Well No. 14, shut-off. D-912.
Well No. 23, drill. DD-677.
Well No. 24, drill. DD-678.

SECTION 22.

Standard Oil Co.
Well No. 5, shut-off. D-501.
Well No. 5, abandon. DD-704.
Approved with recommendations.
Well No. 7, redrill. DD-524.
Approved.
Well No. 7, abandon. DD-679.
Approved with recommendations.
Well No. 11, shut-off. D-530.

Associated Oil Co.
Well No. 3, shut-off. D-313.
Well No. 3, shut-off. D-522.
Well No. 3, shut-off. D-550.
Well No. 63, test 8″ casing. DD-249.
Well No. 63, abandon lower portion. DD-259.
Approved.
Well No. 63, deepen. DD-303.
Approved.
Well No. 63, shut-off. D-659.
Approved for the purpose of prospecting ahead.

SECTION 24.

Union Oil Co.
Well No. 1, Barnodon, abandon. DD-293.

San Francisco Midway Oil Co.
Well No. 2, redrill. DD-780.
Well No. 2, shut-off. D-843.

SECTION 25.

Kern Trading and Oil Co.
- Well No. 9, shut-off. D-791.
- Well No. 10, shut-off. D-287.
- Well No. 13, shut-off. D-273.
- Well No. 21, drill. DD-685.

SECTION 26.

Associated Oil Co.
- Well No. 6, shut-off. Letter 10/16/16.
- Well No. 6, shut-off. D-514.
- Well No. 34, test 10″ casing. DD-248.
- Well No. 34, shut-off. D-345.
- Well No. 44, shut-off. D-704.
- Well No. 44, drill. Letter 5/18/17.
- Well No. 73, drill. DD-337.
- Well No. 73, shut-off. Letter 11/29/16.
- Well No. 73. D-567.
- Well No. 83, shut-off. D-266.
- Well No. 93, deepen. DD-560.

Standard Oil Co.
- Well No. 12, shut-off. D-245.
- Well No. 13, redrill and deepen. DD-903.
- Well No. 14, shut-off. D-374.
- Well No. 15, shut-off. D-349.
- Well No. 16, shut-off. D-549.
- Well No. 17, shut-off. D-593.
- Well No. 19, shut-off. D-619.
- Well No. 19, redrill. DD-583.

SECTION 27.

Kern Trading and Oil Co.
- Well No. 2, redrill. DD-332.
  Approved proposal to repair in satisfaction of complaints of neighbors. (See informal complaints.)
- Well No. 25, shut-off. D-798.
- Well No. 28, shut-off. D-755.
- Well No. 31, shut-off. D-792.

Midway Gas Co.
- Well No. 27, drill. DD-698.

SECTION 31.

C. C. M. O. Co.
- Well No. 16, shut-off. D-515.
- Well No. 17, shut-off. D-582.
- Well No. 18, shut-off. D-676.
- Well No. 18, redrill. DD-671.
- Well No. 19, shut-off. D-657.
- Well No. 20, shut-off. D-731.
- Well No. 20, redrill. DD-889.
- Well No. 21, shut-off. D-718.
- Well No. 21, redrill. DD-634.
- Well No. 22, shut-off. D-663.
- Well No. 23, shut-off. D-738.
- Well No. 23, redrill. DD-635.
- Well No. 23, shut-off. D-862.
- Well No. 24, shut-off. D-734.
- Well No. 24, redrill. DD-636.

C. C. M. O. Co.
  Well No. 24, shut-off. D-794.
  Well No. 26, shut-off. D-789.
  Well No. 27, shut-off. D-728.
  Well No. 29, shut-off. D-852.
  Well No. 30, shut-off. D-817.
  Well No. 31, shut-off. D-814.

Standard Oil Co.
  Well No. 11, Eagle Creek, redrill. DD-848.
  Well No. 12, Eagle Creek, shut-off. D-298.
  Well No. 17, Eagle Creek, redrill. DD-591.
  Well No. 17, shut-off. D-769.
  Well No. 18, Eagle Creek, shut-off. D-790.
  Well No. 19, Eagle Creek, shut-off. D-759.
  Well No. 20, Eagle Creek, shut-off. D-830.
  Well No. 20, Eagle Creek, redrill. DD-902.
  Well No. 21, Eagle Creek, redrill. DD-811.
    Recommended test of water string and furnished company copy of log.
  Well No. 22, Eagle Creek, drill. DD-850.

Honolulu Consolidated Oil Co.
  Well No. 10, redrill. DD-346.

SECTION 32.

California Midway Oil Co.
  Well No. 10, shut-off. D-243.
  Well No. 10, test by pumping. DD-219.
  Well No. 10, deepen. DD-329.
  Well No. 10, redrill. DD-904.

Pacific Crude Oil Co.
  Well No. 1, redrill. DD-217.

Alaska Pioneer Oil Co.
  Well No. 4, abandon. DD-331.
  Well No. 8, drill. Letter 11/7/16.
  Well No. 8, shut-off. D-607.
  Well No. 8, redrill. DD-564.
  Well No. 8, redrill. DD-660.
  Well No. 8, deepen. DD-768.
  Well No. 10, redrill and deepen. DD-156.

SECTION 33.

Kern Trading and Oil Co.
  Well No. 7, redrill. DD-606.
  Well No. 10, shut-off. D-668.

SECTION 34.

Associated Oil Co.
  Well No. 91, shut-off. D-281.

SECTION 35.

Kern Trading and Oil Co.
  Well No. 1, deepen. DD-604.
  Well No. 23, shut-off. D-669.
  Well No. 24, shut-off. D-702.
  Well No. 25, shut-off. D-644.
  Well No. 27, shut-off. D-520.

SECTION 36.

Standard Oil Co.
  Well No. 5, McNee, redrill. DD-726.
  Well No. 12, McNee, redrill and deepen. DD-531.

Standard Oil Co.
Well No. 14, McNee, deepen. DD-727.
Well No. 20, McNee, redrill and deepen. DD-575.
Well No. 25, McNee, deepen. DD-728.
Well No. 38, McNee, shut-off. D-303.
Well No. 42, shut-off. D-261.
Well No. 43, McNee, shut-off. D-334.
Well No. 43, McNee, redrill. DD-538.
Well No. 43, McNee, deepen. DD-894.
Well No. 44, shut-off. D-517.
Well No. 45, McNee, shut-off. D-315.
Well No. 45, McNee, deepen. DD-862.
Well No. 46, McNee, shut-off. D-343.
Well No. 47, McNee, shut-off. D-693.
Well No. 48, shut-off. D-503.
Well No. 49, shut-off. D-546.
Well No. 50, McNee, shut-off. D-568.
Well No. 50, McNee, redrill. DD-522.
Well No. 50, McNee, shut-off. D-678.
Well No. 51, McNee, shut-off. D-638.
Well No. 52, McNee, shut-off. D-672.
Well No. 52, deepening. DD-585.
Well No. 52, deepen. DD-593.
Well No. 53, McNee, shut-off. D-565.
Well No. 54, McNee, shut-off. D-795.
Well No. 55, shut-off. D-885.
Well No. 56, McNee, shut-off. D-841.
Well No. 57, McNee, begin drilling. DD-779.

T. 31 S., R. 24 E., M. D. B. & M.

SECTION 31.

Kern Trading and Oil Co.
Well No. 10, shut-off. D-618.

T. 31 S., R. 32 E., M. D. B. & M.

SECTION 36.

C. C. M. O. Co.
Well No. 36, shut-off. D-845.

T. 32 S., R. 22 E., M. D. B. & M.

SECTION 1.

C. C. M. O. Co.
Well No. 20, shut-off. D-617.

Chanslor-Canfield Co.
Well No. 21, shut-off. D-641.
Well No. 22, shut-off. D-642.

Chanslor-Canfield Midway Oil Co.
Well No. 23, shut-off. D-667.
Well No. 23, redrill. DD-656.
Well No. 23, shut-off. D-788.

T. 32 S., R. 23 E., M. D. B. & M.

SECTION 1.

Kern Trading and Oil Co.
  Well No. 32, shut-off. D-296.
  Well No. 36, shut-off. D-388.
  Well No. 37, shut-off. D-347.
  Well No. 41, begin drilling. DD-795.
  Well No. 56, begin drilling. DD-796.
  Well No. 57, begin drilling. DD-797.
  Well No. 58, begin drilling. DD-798.
  Well No. 59, begin drilling. DD-799.
  Well No. 59, shut-off. D-924.

SECTION 2.

North American Oil Consolidated.
  Well No. 7, redrill. DD-803.
  Well No. 10, redrill. DD-802.

SECTION 3.

Kern Trading and Oil Co.
  Well No. 11, shut-off. D-609.

SECTION 4.

California Counties Oil Co.
  Well No. 1, deepen. DD-382.

Canadian Pacific Oil Co.
  Well No. 4, begin drilling. DD-289.
  Well No. 4, shut-off. D-541.

Standard Oil Co.
  Well No. 7, Equitable, redrill. DD-523.
  Well No. 7, Equitable, shut-off. D-831.

Midway Consolidated Co.
  Well No. 6, shut-off. D-548.
  Well No. 6, shut-off. D-594.

SECTION 5.

Kalispell Oil Co.
  Well No. 2, abandon. DD-765.
  See Complaint No. 11.
  Well No. 2, shut-off. D-914.

Midway Premier Oil Co.
  Well No. 13, redrill. DD-239.
  Well No. 13, shut-off. D-367.

Midway Five Oil Co.
  Well No. 7, shut-off. D-297.

SECTION 6.

Chanslor-Canfield Midway Oil Co.
  Well No. 25, redrill. DD-373.
  Well No. 41, abandon. DD-372.
  Well No. 41, shut-off. D-583.
  Well No. 45, abandon. DD-379.
  Well No. 46, shut-off. D-380.
  Well No. 46, abandon. DD-359.
  Well No. 47, shut-off. D-382.
  Well No. 48, shut-off. D-386.
  Well No. 49, shut-off. D-521.

Chanslor-Canfield Midway Oil Co.
Well No. 49, abandon. DD-360.
Well No. 50, shut-off. D-534.
Well No. 50, abandon. DD-361.
Well No. 51, shut-off. D-538.
Well No. 52, shut-off. D-535.
Well No. 53, shut-off. D-584.
Well No. 54, shut-off. D-543.
Well No. 55, shut-off. D-613.
Well No. 56, shut-off. D-739.
Well No. 57, shut-off. D-779.
Well No. 58, shut-off. D-639.
Well No. 58, redrill. DD-782.
Well No. 58, shut-off. D-891.
Well No. 59, begin drilling. DD-739.
Well No. 59, shut-off. D-904.
Well No. 60, shut-off. D-671.
Well No. 61, begin drilling. DD-740.
Well No. 61, shut-off. D-853.
Well No. 62, begin drilling. DD-741.
Well No. 63, begin drilling. DD-742.
Well No. 63, shut-off. D-905.

United Oil Co.
Well No. 2-A, redrill. DD-325.
Well No. 3, redrill. DD-891.
Well No. 6, redrill. DD-648.
Well No. 6, redrill. DD-870.
Well No. 7, shut-off. D-502.
Well No. 7, redrill. DD-324.

SECTION 8.

Hale-McLeod Oil Co.
Well No. 17, shut-off. D-293.
Well No. 18, shut-off. D-368.
Well No. 19, shut-off. D-572.
Well No. 20, shut-off. D-689.

Chanslor-Canfield Midway Oil Co.
Well No. 26, shut-off. D-504.

SECTION 9.

Chanslor-Canfield Midway Oil Co.
Well No. 19, shut-off. D-321.

SECTION 10.

Standard Oil Co.
Well No. 8, Equitable, shut-off. D-302.
Well No. 11, shut-off. D-539.

SECTION 12.

Standard Oil Co.
Well No. 8, redrill. DD-574.

SECTION 14.

Union Oil Co. of Cal.
Well No. 1, redrill. DD-318.
Well No. 4, begin drilling. DD-781.
Well No. 6, Regal, deepen. DD-245.
Well No. 6, Regal, deepen. DD-343.
Well No. 6, Regal, shut-off. D-620.
Well No. 8, Regal, deepen. DD-246.

Standard Oil Co.
Well No. 13. shut-off. D-608.
Well No. 13. shut-off. D-706.
Well No. 13. pass for pumping test. DD-696.

SECTION 15.

Empire Gas and Fuel Co.
Well No. 2. abandon. DD-227.
Well No. 3. redrill. DD-867.
Well No. 4. shut-off. D-518.
Well No. 4. shut-off. D-570.
Well No. 4. deepen. DD-668.

SECTION 17.

Chanslor-Canfield Midway Oil Co.
Well No. 23. redrill. DD-374.
Well No. 24. redrill. DD-312.

SECTION 22.

Indian and Colonial Development Co.
Well No. 1. shut-off. D-876.
Well No. 1. shut-off. D-874.
Well No. 2. shut-off. D-875.
Well No. 23. shut-off. D-877.

Fairbanks Oil Co.
Well No. 11. shut-off. D-748.
Well No. 12. commence drilling. DD-855.

SECTION 23.

Traders Oil Co.
Letter Dec. 14. 1916. Shut-off.
Well No. 71, redrill. DD-280.
Well No. 71. shut-off. D-870.
Well No. 73. shut-off. D-872.
Well No. 74. shut-off. D-907.
Well No. 75. shut-off. D-901.
Well No. 76. shut-off. D-899.
Well No. 78. shut-off. D-871.
Well No. 79. shut-off. D-892.
Well No. 80. shut-off. D-921.
Well No. 81. shut-off. D-869.
Well No. 82. shut-off. D-873.
Well No. 106. shut-off. D-323.
Well No. 106. locate water. DD-357.
Well No. 106. shut-off. D-691.
Well No. 106. shut-off. D-717.

Cheney Stimson Oil Co.
Well No. 2. shut-off. D-893.
Well No. 6, shut-off. D-664.

SECTION 24.

Jameson Oil Co.
Well No. 6. shut-off. D-855.
Well No. 14. shut-off. D-751.
Well No. 16. commence drilling. DD-892.

SECTION 25

T. W. Co.
Well No. 1. redrill. DD-334.
Well No. 4. redrill. DD-341.

Princeton Oil Co.
Well No. 5, abandon. DD-869.

General Pet. Co.
Well No. 43, shut-off. D-577.
Well No. 44, shut-off. D-526.

B. H. & C. Oil Co.
Well No. 1, redrill. DD-251.

Tamalpais Oil Co.
Well No. 3, shut-off. D-272.

SECTION 26.

Mascot Oil Co.
Well No. 11, redrill. DD-321.
Well No. 24, redrill. DD-242.
Well No. 27, redrill. DD-241.
Well No. 30, redrill. DD-338.
Well No. 44, shut-off. D-564.
Well No. 45, shut-off. D-581.
Well No. 46, shut-off. D-630.
Well No. 48, shut-off. D-616.
Well No. 49, shut-off. D-631.
Well No. 50, shut-off. D-666.
Well No. 51, shut-off. D-679.

Associated Oil Co.
Well No. 1, begin drilling. DD-672.
Well No. 25, redrill. DD-626.
Well No. 25, shut-off. D-732.
Well No. 42, make formation shut-off. DD-584.
Well No. 42, redrill (plug bottom). DD-884.
Well No. 53, North Am., shut-off. D-684.
Well No. 58, redrill. DD-627.

North American Consolidated Co.
Well No. 58, shut-off. D-309.
Well No. 64, shut-off. D-259.

Mt. Diablo Oil, Mining and Development Co.
Well No. 5, shut-off. D-274.
Well No. 5, shoot. DD-250.

Dunlop Oil Co.
Well No. 9, commence drilling. DD-863.

SECTION 36.

Associated Oil Co.
Well No. 1, shut-off. D-778.
Well No. 1, shut-off. D-810.

T. 32 S., R. 24 E., M. D. B. & M.

SECTION 6.

Honolulu Cons. Oil Co.
Well No. 3, redrill. DD-762.
Well No. 4, redrill. DD-339.
Well No. 4, abandon. DD-573.
Well No. 5, deepen. DD-895.

SECTION 7.

Kern Trading and Oil Co.
Well No. 31, shut-off. D-842.

Midway Gas Co.
Well No. 35, shut-off. D-711.

SECTION 8.

Honolulu Oil Co.
  Well No. 9, shut-off. D-590.

SECTION 9.

Kern Trading and Oil Co.
  Well No. 12, deepen. DD-603.
  Well No. 16, shut-off. D-897.
  Well No. 20, shut-off. D-330.
  Well No. 20, shut-off. D-701.
  Well No. 20, redrill. DD-599.
  Well No. 21, shut-off. D-886.

Midway Gas Co.
  Well No. 3, shut-off. D-574.
  Well No. 60, begin drilling. DD-697.

SECTION 10.

Honolulu Oil Co.
  Well No. 9, shut-off. D-305.
  Well No. 9, plug off bottom water. DD-265.

Honolulu Cons. Oil Co.
  Well No. 9, shut-off. D-357.
  Well No. 10, shut-off. D-379.
  Well No. 11, shut-off. D-681.

SECTION 12.

Honolulu Oil Co.
  Well No. 2, shut-off. D-606.

SECTION 14.

Honolulu Cons. Oil Co.
  Well No. 2, redrill. DD-592.
  Well No. 2, redrill. DD-631.
  Well No. 2, shut-off. D-847.

SECTION 15.

Kern Trading and Oil Co.
  Well No. 1, shut-off. D-742.
  Well No. 5, shut-off. D-254.
  Well No. 6, shut-off. D-255.

SECTION 16.

Standard Oil Co.
  Well No. 2, shut-off. D-355.
  Well No. 5, Derby, redrill and deepen. DD-544
  Well No. 14, Derby, redrill. DD-362.
  Well No. 15, shut-off. D-262.
  Well No. 17, shut-off. D-339.
  Well No. 18, shut-off. D-292.
  Well No. 19, shut-off. D-333.
  Well No. 20, Derby, shut-off. D-662.
  Well No. 21, Derby, shut-off. D-603.
  Well No. 21, Derby, redrill. DD-561.
  Well No. 21, shut-off. D-767.
  Well No. 22, Derby, shut-off. D-643.
  Well No. 23, shut-off. D-736.
  Well No. 24, Derby, begin drilling. DD-786
  Well No. 26, Derby, begin drilling. DD-787.

St. Helens Pet. Co., Ltd.
Well No. 5, deepen. DD-277.
Well No. 9, redrill. DD-551.
Well No. 17, shut-off. D-336.
Well No. 18, shut-off. D-378.
Well No. 20, shut-off. D-764.
Well No. 20, shut-off. D-765.
Well No. 21, begin drilling. DD-720.
Well No. 21, shut-off. D-854.
Well No. 21, redrill. DD-842.

Southern California Gas Co.
Well No. 4, shut-off. D-291.
Well No. 5, shut-off. D-310.
Well No. 6, shut-off. D-611.
Well No. 6, redrill. DD-629.

Approved proposal to make tests to determine source of water. See Complaint No. 25.

Petroleum Midway Co., Ltd.
Well No. 1, redrill. DD-231.
Well No. 4, redrill. DD-841.
Well No. 6, deepen. DD-252.
Well No. 7, shut-off. D-329.
Well No. 7, shut-off. D-356.
Well No. 8, shut-off. D-304.
Well No. 8, shut-off. D-604.
Well No. 9, abandon. DD-791.
Well No. 9-A, commence drilling. DD-851.
Well No. 10, shut-off. D-519.

SECTION 17.

Kern Trading and Oil Co.
Well No. 10, commence drilling. DD-836.
Well No. 25, begin drilling. DD-687.
Well No. 27, shut-off. D-828.
Well No. 29, shut-off. D-575.
Well No. 29, redrill and deepen. DD-881.
Well No. 30, make deeper shut-off. DD-348.
Well No. 30, shut-off. D-576.

SECTION 18.

Standard Oil Co.
Well No. 1, abandon. DD-340.
Well No. 8, redrill. DD-255.
Well No. 9, redrill. DD-270.
Well No. 9, redrill. DD-580.
Well No. 10, shut-off. D-508.
Well No. 14, shut-off. D-529.
Well No. 14, redrill. DD-590.
Well No. 15, shut-off. D-389.
Well No. 15, shut-off bottom water. DD-730.
Well No. 16, shut-off. D-632.
Well No. 16, redrill and deepen. DD-746.
Well No. 17, shut-off. D-930.
Well No. 17, begin drilling. DD-788.
Well No. 18, shut-off. D-745.
Well No. 19, begin drilling. DD-785.
Well No. 20, begin drilling. DD-840.

SECTION 19.

Kern Trading and Oil Co.
Well No. 9, deepen and redrill. DD-267.
Well No. 9, shut-off. D-537.
Well No. 21, abandon. DD-887.
Well No. 31, shut-off. D-766.
Well No. 32, shut-off. D-813.
Well No. 33, commence drilling. DD-837.
Well No. 37, commence drilling. DD-838.

SECTION 20

Standard Oil Co.
Well No. 8, shut-off. D-636.
Well No. 10, redrill. DD-587.

SECTION 22.

Maricopa Investment Co.
Well No. 1, Luxor, abandon. DD-244.

SECTION 24.

Honolulu Cons. Oil Co.
Well No. 1, abandon. DD-681.
Well No. 2, abandon. DD-682.
Well No. 3, abandon. DD-683.

SECTION 28.

Standard Oil Co.
Well No. 6, redrill. DD-586.
Well No. 9, shut-off. D-528.

SECTION 30.

Well No. 14, redrill. DD-582.
Well No. 27, shut-off. D-658.
Well No. 28, shut-off. D-733.
Well No. 29, shut-off. D-819.

This well was later redrilled to protect and produce an oil sand cased off behind the water string. This sand was at last reports producing at the rate of 50 bbls. per day. It is our understanding that the work was done as a result of the recommendations of Mr. R. Stoner, the company geologist.

SECTION 32.

American Oilfields Co.
Well No. 12, redrill. DD-662.

General Petroleum Corporation.
Well No. 14, redrill. DD-304.

Edmonds Midway Co.
Well No. 4, shut-off. D-252.

SECTION 33.

Kern Trading and Oil Co.
Well No. 21, deepen. DD-602.

T. 11 N., R. 23 W., S. B. B. & M.

SECTION 4.

Union Oil Co.
International No. 5, drill new well. DD-238.
International No. 5, drill. DD-258.

Method described under subheading "Sunset Field."

International No. 5, shut-off. D-506.

Union Oil Co.
International No. 5, shut-off. D-599.
International No. 5, redrill. DD-521.
International No. 5, shut-off. D-723.
International No. 5, shut-off. D-724.
International No. 5, shut-off. D-784.
International No. 6, redrill. DD-754.

The proposal of the company was to drill this well with a top water shut-off at 3100 ft., thus passing up the upper oils known to exist in the district. The above report recommended landing the 10″ casing at 2714 ft., and mudding under a pressure each sand below, to a depth of 3115 ft., and cementing at that depth. The company objected to the ruling and a conference between officials of the company and the State Oil and Gas Supervisor and his deputies was held at Los Angeles, which resulted in a decision to hold a public hearing at Taft on July 27, 1917. The hearing was held on the date set and a great amount of testimony was offered. The operators present were practically unanimous in agreeing that if mudding to protect sands was permitted at all, it should only be permitted after the top water had been cased off by means of metal pipe. Transcript of the hearing is on file at the office of the Supervisor. As a result of the conference, the Department reported as follows:

"At your written request, a reconsideration of our report No. DD-754 was given at the public conference at Taft on July 27, 1917. This report amends and supersedes said report.

"The proposal to drill this well by landing the 10″ water string at 3100′ is rejected.

"This Department recommends and requires:

"First: That the 10″ casing be set and cemented in the hard, sandy blue shale between depths of 2647′ and 2700′ (as shown in the log of Well No. 2). The shut-off shall be witnessed by the department in the usual manner.

"Second: That the hole be drilled in such a manner as to definitely locate the sands logged in well No. 2 between depths of 2700′ and 2742′. When such sands are located they be mudded under pressure of 400 pounds per square inch with thin mud until no more mud can be pumped in, and drilling then continued through the flowing water expected between depths of about 3071′ and 3111′. In said continued drilling each sand as encountered shall be thoroughly filled with mud in the manner heretofore set forth.

"Third: The 8¼″ casing shall be landed and cemented at least 50 feet below the aforesaid flowing water. In cementing the 8¼″ casing enough cement shall be used to extend up to the shoe of the 10″ casing (estimated to be from 50 to 150 sacks). Said cementing of 8¼″ casing to be witnessed by a representative of this department.

"Fourth: Test of shut-off by 8¼″ casing to be witnessed in the usual manner."

The well was finally completed in accordance with the recommendations of the State Mining Bureau, and is proving a good producer.

Lake View No. 2 Oil Co.
Well No. 1, redrill. DD-208.
Approved proposal.
Well No. 1, redrill. DD-769.
Approved amended proposal.

This work has since been completed and the well brought in producing clean oil from the sand from which it originally gushed. A great amount of time and money was spent in cleaning out the old 6¼″ casing to shoot and plug it at a depth of 2920 ft. The hole was then redrilled from 2510′ to 2950′, and after shooting again at 2920′, the new string of 6¼″ casing was cemented at 2950′ with 160 sacks of cement after mudding the hole under a pressure of 700 pounds per square inch. The management and local superintendent of the company deserve great credit for the complete success of the job.

Well No. 1, shut-off. D-864.
Well No. 3, redrill. DD-301.

Lake View No. 2 Oil Co.
Well No. 3, shut-off. D-750.
Well No. 3, shut-off. D-807.
Well No. 5, shut-off. D-286.
Well No. 7, shut-off. D-285.
Well No. 7, shut-off. D-509.
Well No. 9, shut-off. D-505.
Well No. 9, shut-off. D-628.
Well No. 9, deepen. DD-588.
Well No. 11, begin drilling. DD-666.

Pat Welch.
Well No. 3, shut-off. D-375.
Well No. 4, begin drilling. DD-311.
Well No. 4, drill. DD-525.
Well No. 4, shut-off. D-725.
Well No. 4, shut-off. D-768.
Well No. 4, shut-off. D-782.
Well No. 4, redrill. DD-734.
Well No. 4, shut-off. D-818.
Well No. 4, shut-off. D-825.
Well No. 4, redrill. DD-758.
Well No. 4, shut-off. D-895.
Well No. 4, shut-off. D-837.

Interstate Oil Co.
Well No. 10, concerning method of drilling. DD 349.
Well No. 10, deepen. DD-518.
Well No. 10, shut-off. D-726.
Well No. 10, deepen. DD-755.
Well No. 12, shut-off. D-747.
Well No. 14, begin drilling. DD-766.

SECTION 5.

Kern Trading and Oil Co.
Well No. 3, abandon. DD-651.
Well No. 29, begin drilling. DD-675.
Well No. 31, begin drilling. DD-386.
Well No. 31, shut-off. D-722.
Well No. 31, shut-off. D-793.

SECTION 6.

General Petroleum Co.
Well No. 5-B, redrill. DD-375.

General Petroleum Corp.
Well No. 5-B, abandon. DD-847.
Well No. 6-B, redrill. DD-305.
Well No. 6-B, redrill. DD-702.
Well No. 7-B, abandon. DD-846.
Well No. 13-B, shut-off. D-383.
Well No. 13-B, abandon. DD-381.

Bankline Oil Co.
Well No. 5, shut-off. D-373.
Well No. 5, redrill. DD-637.
Approved.

This well was later abandoned and converted into a water well. In this work an interesting discovery was made. After completing the plugging from the bottom up into the "water string" to a depth of about 2200′, the water string was perforated between depths of 500′ and 1000′ before bailing, and it was found that oil sand was coming into the well through the perforations in the water string.

H. H. Hart & H. M. Payne.
Well No. 1, begin drilling. DD-733.

SECTION 7.

Standard Oil Co.
Well No. 2, Monarch, commence drilling. DD-843.
Well No. 2, Monarch, shut-off. D-888.

SECTION 8.

Sunset Extension Oil Co.
Well No. 1, redrill. DD-689.
Well No. 1, shut-off. D-900.

Nellie Adamson.
Well No. 2, Midway Southern, abandon. DD-839.

Rejected for lack of log. This is one of several applications to abandon wells made by "homesteaders" who, after certain formalities, laid claim to pipe beneath the ground, as well as to surface rights.

Bronco Lease (W. G. Kerckhoff).
Well No. 1, redrill. DD-676.
Well No. 1, redrill. DD-722.

SECTION 17.

Hazleton Crude Oil Co.
Well No. 1, abandon. DD-387.
Well No. 1, shut-off. D-690.

SECTION 35.

J. F. Lingo Co.
Well No. 1, abandon. DD-752.

This work was begun without notice to the department and as the result of a "homesteader" laying claim to the pipe in the well.

T. 11 N., R. 24 W., S. B. B. & M.

SECTION 1.

Standard Oil Co.
Well No. 1, Maricopa, shut-off. D-260.
Well No. 6, Maricopa, redrill and deepen. DD-530.
Well No. 6, shut-off. D-727.
Well No. 6, Maricopa, shut-off. D-868.
Well No. 15, redrill. DD-352.
Well No. 22, Maricopa, shut-off. D-263.
Well No. 22, redrill. DD-356.
Well No. 23, Maricopa, redrill. DD-549.
Well No. 23, shut-off. D-673.
Well No. 24, shut-off. D-344.
Well No. 25, Maricopa, shut-off. D-692.
Well No. 26, Maricopa, begin drilling. DD-767.
Well No. 26, shut-off. D-887.

Lowell Oil Co.
Well No. 1, deepen. DD-383.
Well No. 1, abandon. DD-748.
Well No. 11, redrill. DD-350.

SECTION 2.

McCutcheon Bros.
Well No. 3, locate and shut off water. DD-333.
Well No. 8, deepen. DD-330.

Anchor Oil Co.
Well No. 17, redrill. DD-565.

United Oil Co.
Well No. 1, redrill and deepen. DD-328.
Well No. 2, redrill. DD-652.
Well No. 4, shut-off. D-580.

Heard & Painter.
Well No. 5, shut-off. D-773.

Ida May Oil Co.
Well No. 5, commence drilling. DD-864.

Ruby Oil Co.
Well No. 4, redrill. DD-743.
Well No. 10, redrill. DD-566.

Standard Oil Co.
Well No. 36, Sunset Monarch, shut-off. D-829.
Well No. 13 (Monarch), redrill. DD-750.
Well No. 36 (Monarch), begin drilling. DD-784.
Well No. 37 (Monarch, Sec. 2), commence drilling. DD-898.
Well No. 38 (Monarch), commence drilling. DD-899.
Well No. 23, redrill. DD-384.

SECTION 12.

Good Roads Oil Co.
Well No. 7, redrill. DD-548.
Well No. 7, shut-off. D-783.
Well No. 7, abandon. DD-749.
Well No. 7-A, begin drilling. DD-757.
Well No. 7-A, redrill. DD-905.

Walter Snook.
Well No. 2, redrill. DD-261.

Northern Oil Co.
Well No. 4, abandon. DD-229.

Petrolia Oil Co.
Well No. 5, shut-off. D-253.

T. 12 N., R. 23 W., S. B. B. & M.

SECTION 6.

Bankline Oil Co.
Well No. 4, shut-off. D-699.

Maricopa National Co.
Well No. 7, shut-off. D-561.

SECTION 30.

Whittaker, Doan and Laymance, H. M. Payne, Receiver.
Well No. 1, redrill. DD-274.

SECTION 31.

Kern Trading and Oil Co:
Well No. 2, shut-off. D-624.
Well No. 2, deepen. DD-605.
Well No. 8, deepen. DD-268.
Well No. 58, begin drilling. DD-807.
Well No. 59, begin drilling. DD-808.
Well No. 60, begin drilling. DD-809.
Well No. 61, begin drilling. DD-810.
Well No. 138, shut-off. D-908.

SECTION 32.

Spreckels Oil Co., H. M. Payne, Receiver.
Well No. 4, redrill and abandon lower part. DD-272.
Well No. 4, shut-off. D-531.
Well No. 5, redrill. DD-747.
Well No. 7, deepen. DD-273.

National Pacific Oil Co., H. M. Payne, Receiver.
Well No. 1, redrill. DD-308.

Pacific Midway Oil Co., H. M. Payne, Receiver.
Well No. 5, deepen. DD-271.
Well No. 5, shut-off. D-360.
Well No. 5, shut-off. D-552.

Midway Northern Oil Co.
Well No. 2, shut-off. D-525.
Well No. 3, shut-off. D-322.
Well No. 3, shut-off. D-364.
Well No. 3, shut-off. D-589.

General Petroleum Corp.
Well No. 4-A, redrill. DD-623.
Well No. 4-A, Annex, shut-off. D-805.

Obispo Oil Co.
Well No. 3, shut-off. D-308.

This test was made after the repair of the well while under the hands of the receiver. The trouble was overcome by replacing the $4\frac{1}{2}''$ casing, which had been eaten out by "bad water," with a new string which was cemented.

The test was satisfactory.

SECTION 34.

Comstock Crude Oil Co.
Well No. 1, redrill and deepen. DD-302.
Well No. 1, redrill. DD-516.
Well No. 1, redrill. DD-622.
Well No. 1, abandon. DD-794.
Well No. 1, abandon. DD-907.

T. 12 N., R. 24 W., S. B. B. & M.

SECTION 25.

Kern Trading and Oil Co.
Well No. 1, redrill. DD-650.
Well No. 11, abandon. DD-213.
Well No. 13, abandon. DD-212.

Union Oil Co.
Well No. 12, Lake View, abandon. DD-216.

SECTION 26.

Sunset-Monarch Oil Co.
Well No. G, shut-off. D-569.
Well No. 1, redrill. DD-358.
Well No. M, shut-off. D-316.

Standard Oil Co.
Well No. 6 (Monarch), abandon. DD-893.
Well No. 12 (S. Monarch), shut-off. D-816.

SECTION 32.

Mother Colony Oil Co.
Well No. 1, abandon. DD-601.

SECTION 35.

Midway Oil Co.
Well No. 9 (Sage), abandon. DD-789.

Midway Oil Co. (work done by Midway Supply Co.).
Well No. 11 (Sage), shut-off. D-918.
Well No. 11 (Sage), shut-off. D-861.
Well No. 11 (Sage), shut-off. D-866.
Well No. 11 (Sage), shut-off. D-894.
Well No. 11 (Sage), shut-off. D-898.
Well No. 11 (Sage), shut-off. D-902.

Midway Oil Co.
Well No. 11 (Webster), abandon. DD-770.
Well No. 11, abandon. DD-783.
Well No. 48, shut-off. D-710.
Well No. 61, drill. DD-774.
Well No. 61, shut-off. D-851.
Well No. 64, commence drilling. DD-872.
Well No. 65, commence drilling. DD-873.
Well No. 65, shut-off. D-913.

SECTION 36.

Standard Oil Co.
Well No. 1, redrill. DD-388.
Well No. 1 (M. & M.) shut-off. D-655.
Well No. 2, redrill. DD-389.
Well No. 5, abandon. DD-505.
Well No. 6, redrill. DD-502.
Well No. 8, redrill. DD-503.
Well No. 17 (M. J. M. & M.), redrill. DD-725.
Well No. 24, redrill and deepen. DD-256.
Well No. 24, redrill. DD-589.
Well No. 24 (M. J. M. & M.), redrill. DD-745.
Well No. 23 (M. & M.) shut-off. D-381.
Well No. 34, shut-off. D-656.
Well No. 34 (M. J. M. & M.), deepen and redrill. DD-550
Well No. 35 (M. J. M. & M.), shut-off. D-562.
Well No. 36 (M. J. M. & M.), shut-off. D-735.
Well No. 37 (M. J. M. & M.), shut-off. D-799.
Well No. 37 (M. J. M. & M.), redrill. DD-611.
Well No. 37 (M. J. M. & M.), shut-off. D-705.
Well No. 38, shut-off. D-785.
Well No. 39 (M. J. M. & M.), shut-off. D-780.
Well No. 40 (M. J. & M.), shut-off. D-867.
Well No. 41, (M. J. & M.) shut-off. D-823.

Ethel D. Co.
Well No. 31, shut-off. D-289.
Well No. 32, shut-off. D-533.
Well No. 33, shut-off. D-695.
Well No. 34, begin drilling. DD-732.

Maricopa 36 Oil Co.
Well No. 2, deepen. DD-610.

M. & T. Oil Co.
Well No. 3, redrill. DD-327.
Well No. 3, abandon. DD-800.
Well No. 3, shut-off. D-903.

CHAPTER V.

FRESNO COUNTY.

By R. D. BUSH, Deputy Supervisor.

The present deputy took charge of this office March 1, 1917, when Deputy Supervisor M. J. Kirwan was transferred to Los Angeles. The staff, besides the deputy, consists of an inspector and an office assistant. The inspector's duties consist of the compilation of data on various wells and localities, making of well sections, peg models, etc., and testing some of the wells for water shut-off.

Previous to October, 1916, the Lost Hills and Belridge fields were included in the Coalinga district, but were found to be more accessible from Taft.

During the past fiscal year the following notices were received and tests made by the Coalinga office:

114	notices of intention to drill new wells.
92	notices of redrilling to shut off water.
153	notices of redrilling or deepening to increase production.
47	notices of abandonment.
155	wells were tested for water shut-off.

In addition to the regular routine work of making detailed recommendations for drilling, abandonment, depth of water shut-off, and testing of water shut-off at the wells, several extensive investigations have been made in various parts of the field where water conditions are serious, and considerable work has been completed and is now in progress toward remedying these conditions. Improvement in conditions has been shown, and the near future will undoubtedly show a great deal more. The cases are reported in detail under the subject of Complaints.

GENERAL SUMMARY OF WATER CONDITIONS.

The following statistics compiled from reports by the companies to the State Mining Bureau show the amounts of water and oil produced in the Coalinga field in June, 1917, as compared with June, 1916.

Production in Barrels, Month of June, 1916 and 1917. Coalinga Field.

	West Side			East Side			Total field		
	Oil	Water	Per cent water	Oil	Water	Per cent water	Oil	Water	Per cent water
June, 1916	482,997	195,865	28.9	715,910	61,893	7.95	1,198,907	257,758	17.7
June, 1917	457,613	219,718	32.4	824,989	93,420	10.3	1,282,602	313,138	19.6

Wells Producing and Average Production per Well per Day (Barrels). Coalinga Field.

	West Side			East Side			Total field		
	Oil	Water	Wells producing	Oil	Water	Wells producing	Oil	Water	Wells producing
June, 1916	27.9	11.3	576	72.1	6.2	331	44.0	9.5	907
June, 1917	25.8	12.4	589	66.2	7.5	415	42.6	10.4	1,004

The increase in the percentage of water being produced is accounted for by the fact that a number of previously idle wells producing a large quantity of water and a small quantity of oil are now being pumped. Formerly the production from these wells did not pay for the cost of operation, but the increase in the price of oil now makes them profitable. One property on the West Side, idle in 1916, produced in June, 1917, 4500 barrels of fluid, 90% water, from twelve wells. Resumption of operations at such properties now affords opportunities to profitably repair them.

A further indication of the water conditions in the Coalinga field is shown by the following division of the wells into three classes, namely, those that produce daily from 0 to 20 barrels, 20 to 40 barrels, and more than 40 barrels of water, and the same classification for oil.

Classification of Wells by Daily Production of Water (Barrels).

	West Side			East Side			Total field		
	0-20	20-40	40	0-20	20-40	40	0-20	20-40	40
Percentage of total producing wells	85.2	5.3	9.5	92.2	3.9	3.9	88	4.7	7.3

Classification of Wells by Daily Production of Oil (Barrels).

	West Side			East Side			Total field		
	0-20	20-40	40	0-20	20-40	40	0-20	20-40	40
Percentage of total producing wells	54.5	26.1	19.4	30.1	21.2	48.7	44.7	24.2	31.1

The number of wells in this district and the number of logs on file is shown by the following tabulation. The number of graphic logs already completed is also shown in the tabulation:

Field	Wells listed	Logs filed	Graphic logs
Coalinga	1,443	1,265	297

Peg models covering about 2570 acres, or 20% of the proven land in the district, have been constructed.

COMPLAINTS.

Complaint No. 1.

Creme Petroleum Company, Section 30, Township 20 South, Range 15 East, M. D. B. & M.

Efforts to have the owners of the Creme property repair Well No. 1 having failed, a detailed investigation of all surrounding wells was started in September, 1916, with a view to issuing a formal order or orders by the State Supervisor to remedy the water condition. After a complete review of the production and histories of about twenty-three surrounding wells, it was decided that more exact information as to production and fluid levels was needed, and, accordingly, on February 13, 1917, Order No. 1 was issued to the American Petroleum Company, Nevada Petroleum Company, and the Kern Trading and Oil Company, to make accurate determinations of fluid level and daily production of seventeen wells. This included thirteen American Petroleum wells, one Nevada Petroleum Company well, and three Kern Trading and Oil Company wells. This department also had samples of water from nine of these wells analyzed, and constructed a peg model covering an area of about 860 acres in this vicinity and showing one hundred wells. As a result of this investigation, it seemed that, while there was a possibility of more than one well contributing to the water trouble, Creme No. 1 was the worst offender, and, accordingly on June 2, 1917, an order was issued to the Creme Petroleum Company to repair the well according to the requirements of this department. By the end of June, arrangements were completed by the company for doing the work.

ORDER NUMBER ONE,
BY
STATE OIL AND GAS SUPERVISOR R. P. McLAUGHLIN,
DATED FEBRUARY 13, 1917,
RELATIVE TO
CREME PETROLEUM OIL COMPANY WELL No. 1.
Sec. 30, T. 20 S., R. 15 E., M. D. B. & M.
IN THE
COALINGA OIL FIELD OF CALIFORNIA.

To Creme Petroleum Company,
Mrs. Clara Curry, Tulare, Tulare Co., Cal.
William L. McGuire, San Francisco, Cal.
American Petroleum Company.
Nevada Petroleum Company.
Kern Trading & Oil Company.

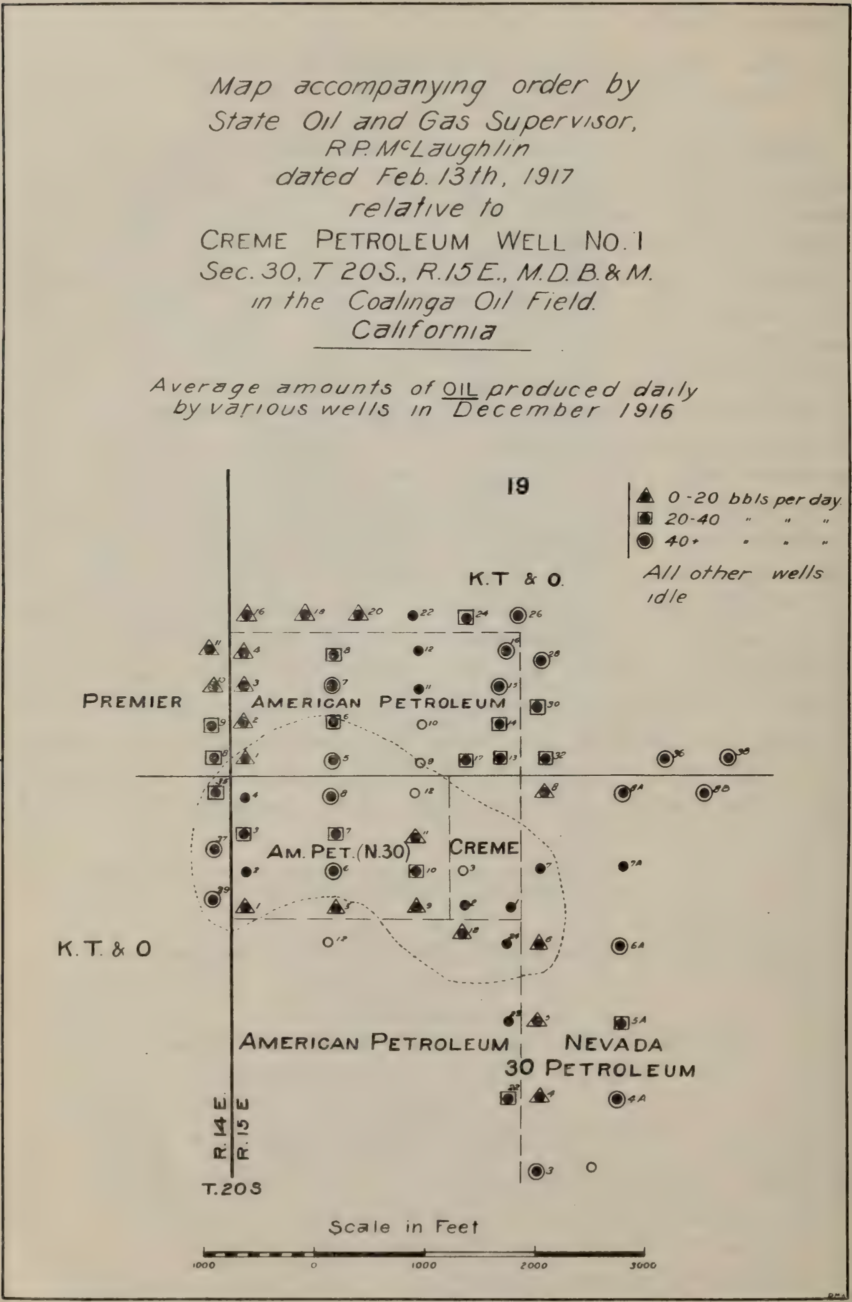

Map accompanying order by
State Oil and Gas Supervisor,
R.P. McLaughlin
dated Feb. 13th, 1917
relative to
CREME PETROLEUM WELL NO. 1
Sec. 30, T 20S., R. 15 E., M.D.B.&M.
in the Coalinga Oil Field
California
Average amounts of OIL produced daily
by various wells in December 1916
19
▲ 0-20 bbls per day
■ 20-40 " " "
◉ 40+ " " "
All other wells idle
K.T. & O.
PREMIER
AMERICAN PETROLEUM
AM. PET. (N.30)
CREME
K.T. & O
AMERICAN PETROLEUM
30
NEVADA PETROLEUM
R. 14 E.
R. 15 E.
T. 20 S
Scale in Feet
1000
0
1000
2000
3000

FIG. 25.

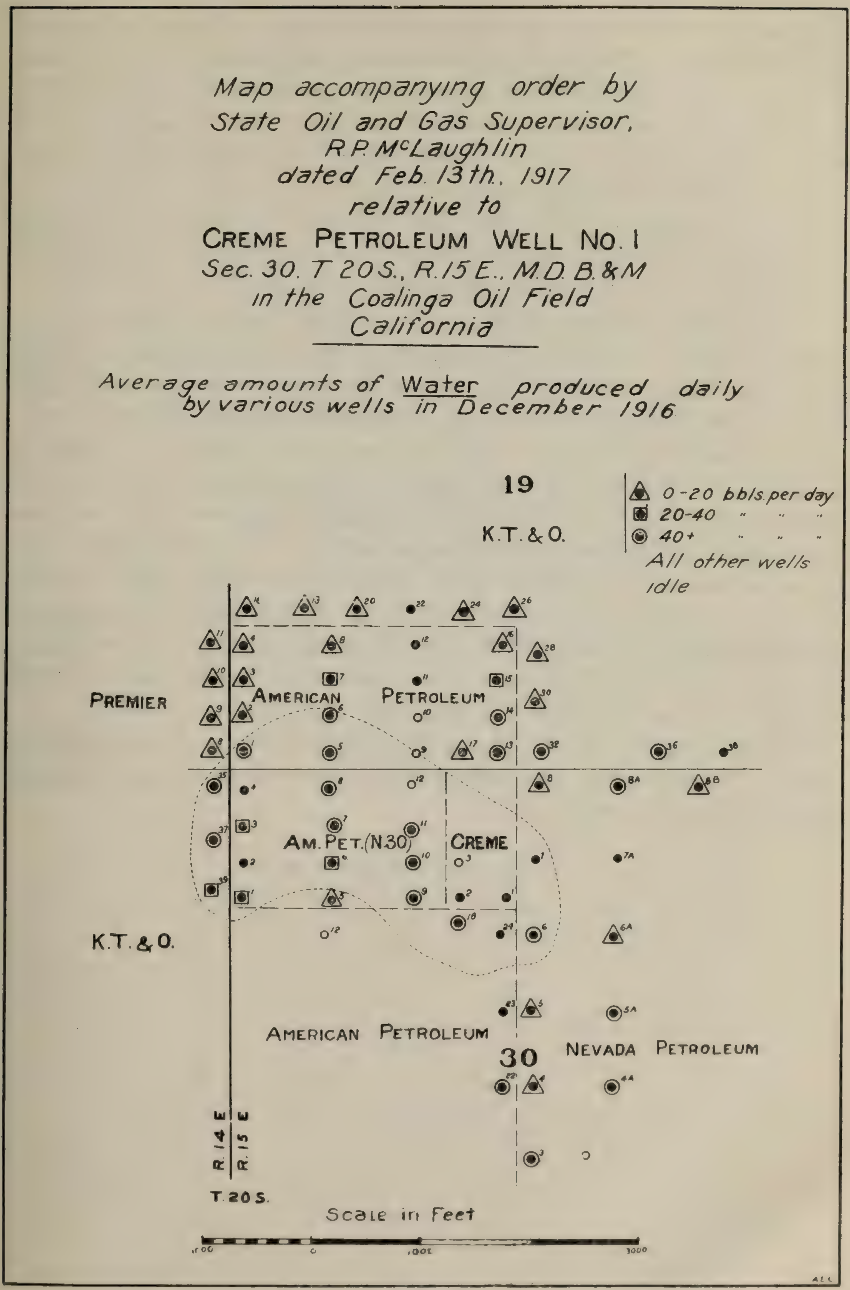

Map accompanying order by
State Oil and Gas Supervisor,
R.P. McLaughlin
dated Feb. 13th., 1917
relative to
CREME PETROLEUM WELL NO. 1
Sec. 30. T 20 S., R. 15 E., M.D. B.&M
in the Coalinga Oil Field
California
Average amounts of Water produced daily by various wells in December 1916
19
K.T. & O.
0-20 bbls. per day
20-40 " " "
40+ " " "
All other wells idle
PREMIER
AMERICAN PETROLEUM
AM. PET. (N. 30)
CREME
K.T. & O.
AMERICAN PETROLEUM
30
NEVADA PETROLEUM
R. 14 E.
R. 15 E.
T. 20 S.
Scale in Feet
1000
0
1000
3000

FIG. 26.

It appearing to the Supervisor that written complaints signed by more than one-third of the individuals or corporations owning land, or operating wells within the radius of one mile of a certain well known and designated as Creme Petroleum Well No. 1, situated in the northeast quarter of the northwest quarter of section 30, T. 20 S., R. 15 E., M. D. B. & M., pursuant to section 11, chapter 718, Statutes of 1915, said Supervisor has caused an investigation to be made and has determined that the following condition exists:

Water in excessive and damaging quantities is at present entering the oil sands of several wells situated within a radius of approximately one-half mile from the Creme Petroleum Well No. 1.

The excessive amount of water is probably due to improper conditions existing at more than one well in the area mentioned. Relief can only be had by treating all the wells under a single comprehensive plan, for the reason that they are intimately related underground.

The investigation began with the assumption that the damaging conditions complained of were local to the immediate vicinity of the Creme Petroleum Well No. 1, but it shortly appeared that the conditions were widespread. Forty-nine wells in the neighborhood, producing a total of 1822 barrels of oil and 2996 barrels of water per day, (nearly two barrels of water to one of oil). The scope of the examination was therefore extended to cover some sixty-three wells which are listed herewith, together with figures showing the average of daily amounts of oil and of water produced by each well.

These figures are for the month of December, 1916, unless otherwise noted. The tabulation also shows the number of days each well produced during the month.

Premier Oil Company.

(Sec. 24, T. 20 S., R. 14 E.)

Well number	Days	Barrels oil	Barrels water
8	6	23	4
9	6	39	1
10	9	17	4
11	31	4	1

Kern Trading and Oil Company.

(Sec. 25, T. 20 S., R. 14 E.)

35	20	36	0 Last ten days all water.
37	31	76	76
39	19	43	30

Kern Trading and Oil Company.

(Sec. 19, T. 20 S., R. 15 E.)

13	28	19	2
18	31	17	7
20	19	19	0.4
22	0	0	0 Idle since October, 1914, account small production.
24	21	25	0.8
25	29	46	1
28	28	63	5
30	9	22	7 July, 1916.
32	9	31	72
36	31	202	50
38	4	171	15 November, 1916.

Nevada Petroleum Company.

(Sec. 30, T. 20 S., R. 15 E.)

3	31	63	118
4	31	11	1
5	31	11	2
6	25	11	124
7	0	0	0 Idle since December, 1914. Water possibly not shut off.
8	31	12	0.2
4a	13	43	67
5a	15	36	56 November, 1916. Working on well in December. Set packer account of water.
6a	31	46	7
7a	0	0	0 Working on well testing water shut off.
8a	31	55	228
8b	31	64	8

American Petroleum Company.

(Sec. 19, T. 20 S., R. 15 E.)

Well number	Days	Barrels oil	Barrels water	
1	31	19	168	
2	31	12	3	
3	31	9	8	
4	**31**	**13**	**7**	
5	31	51	131	
6	31	34	63	
7	31	47	28	
8	31	31	0.9	
11	0	0	0	Recemented September, 1916, account "top" water.
12	0	0	0	Shut down June, 1911, account small production.
13	25	24	72	
14	31	35	41	
15	31	108	38	
16	31	87	10	
17	25	27	17	

American Petroleum Company.

(Sec. 30, T. 20 S., R. 15 E.)

1 (N-30)	31	10	22	
2 (N-30)	0	0	0	Abandoned.
3 (N-30)	31	31	27	
4 (N-30)	0	0	0	Shut down.
5 (N-30)	31	19	1	
6 (N-30)	31	116	39	
7 (N-30)	31	28	214	
8 (N-30)	**31**	**44**	**104**	
9 (N-30)	13	5	431	November, 1916.
10 (N-30)	31	28	43	
11 (N-30)	31	18	284	
12 (N-30)	0	0	0	Abandoned.
18	31	6	132	
22	31	22	250	
23	0	0	0	Idle since October, 1915. (Bridge over oil sand account "top" water.)
24	0	0	0	Idle since August, 1915.

Creme Petroleum Company.

(Sec. 30, T. 20 S., R. 15 E.)

	0	0	0	Idle since 1913.
	0	0	0	Idle since 1913.

For the purpose of comparison the wells are segregated into three classes according to their average daily production of oil:

First: Under 20 bbls. per day.

Second: Between 20 and 40 bbls. per day.

Third: Over 40 bbls. per day.

This segregation is shown on an accompanying map.

For the purpose of comparison the wells are also segregated into three classes, according to the average daily production of water. The same figures are used for this classification as before mentioned (under 20, 20 to 40, and over 40), and this segregation is shown on an accompanying map.

Study of the map upon which the wells are segregated according to the amounts of water produced shows the probable area within which the damage complained of is confined.

Such an area is shown on both of the accompanying maps, its limits, or boundary lines, being in general determined by the location of wells making less than 20 bbls. of water per day.

Wells situated within the area of damage total 23, and are shown in the following list, arranged in order according to the dates at which a marked increase of water occurred. These dates are determined from written reports furnished by the various companies, with the exception of the Creme Petroleum Company for their own wells. In all of the wells, unless otherwise noted, excessive amounts of water have continued or increased since the date given herewith.

Name of well	Number	Section	Township	Range	Date of marked water increase	Average daily production, Dec., 1916, barrels	
						Oil	Water
American Petroleum	5	19	20	15	Nov., 1910	51	131
American Petroleum	6	19	20	15	Jan., 1911	34	63
Creme Petroleum	2	30	------	------	July, 1911	*	*
American Petroleum	1	19	20	15	Sept., 1911	19	168
American Petroleum	12 (N-30)	30	20	15	Feb., 1912	--------	--------
American Petroleum	8 (N-30)	30	20	15	April, 1912	44	104
American Petroleum	2 (N-30)	30	20	15	June, 1912	--------	--------
American Petroleum	1 (N-30)	30	20	15	July, 1912	10	22
American Petroleum	4 (N-30)	30	20	15	July, 1912	--------	--------
Creme Petroleum	1	30	20	15	July, 1912	--------	--------
American Petroleum	6 (N-30)	30	20	15	Aug., 1912	116	39
American Petroleum	7 (N-30)	30	20	15	Sept., 1912	28	214
Nevada Petroleum	6	30	20	15	Nov., 1912	11	124
American Petroleum	18	30	20	15	Jan., 1913	6	132
American Petroleum	21	30	20	15	Jan., 1913	--------	--------
Nevada Petroleum	7	30	20	15	April, 1913	--------	--------
American Petroleum	9 (N-30)	30	20	15	June, 1913	5	431
Kern Trading & Oil	37	25	20	14	Aug., 1913	76	76
Kern Trading & Oil	39	25	20	14	Oct., 1913	43	30
Kern Trading & Oil	35	25	20	14	Oct., 1913	--------	--------
American Petroleum	3 (N-30)	36	20	15	Mar., 1914	31	27
American Petroleum	11 (N-30)	30	20	15	Mar., 1914	18	284
American Petroleum	10 (N-30)	30	20	15	July, 1914	28	43
Totals						520	1 888

*Probably water afterwards eliminated.

Of these twenty-three (23) wells recent production figures are given herewith for fifteen (15), and from them there is a daily production of 520 bbls. of oil and 1888 bbls. of water (nearly four bbls. of water to one of oil).

In addition to the previously mentioned facts the investigation has covered the underground conditions as shown by the well logs. The large amount of data involved in this phase of the work can not be readily summarized here, and in fact can probably be shown only by means of a model which the Supervisor proposes to immediately construct. It may be well, however, to note at this time that the investigation has thus far disclosed that the present condition of Creme Petroleum No. 1 is almost identical with that of American Petroleum Well No. 2 (N-30), Sec. 30, T. 20 S., R. 15 E.; American Petroleum Well No. 4 (N-30), Sec. 30, T. 20 S., R. 15 E.; American Petroleum Well No. 12 (N-30), Sec. 30, T. 20 S., R. 15 E.; Nevada Petroleum Well No. 7, Sec. 30, T. 20 S., R. 15 E.—in that all five wells are plugged above the oil sands. Of these five wells, two—Creme Petroleum No. 1 and American Petroleum No. 2 (N-30)—entered water below the oil sands; both wells were plugged in an attempt to shut off this water from the oil sands. It appears that said plugging in Creme Petroleum Well No. 1 was successful and so demonstrated. No evidence has been presented to the Supervisor proving that said plugging in American Petroleum No. 2 (N-30) was successful.

The foregoing statements of the investigation show that there is not yet enough evidence before the Supervisor to justify an order for extensive repair work on any individual well. The foregoing statements do show that further tests and investigations are justified with a view to more definitely locating the source or sources of water at present entering the oil sands and then repairing the well or wells causing the damage.

Now, therefore, pursuant to Sections 8 and 11 of Chapter 718, Statutes of 1915, it is hereby ordered that the following tests be made:

There are two kinds of comparatively inexpensive tests to be made on certain wells, namely, tests to determine depths at which fluid stands in each well, and tests to more frequently and accurately measure the amounts of oil and water produced by each well. The wells requiring these further tests are:

Kern Trading & Oil Co., Nos. 35, 37, 39, Sec. 25, T. 20 S., R. 14 E.
American Petroleum Co., Nos 1, 5, 6, Sec. 19, T. 20 S., R. 15 E.
American Petroleum Co., Nos. 1 (N-30), 3 (N-30), 6 (N-30), 7 (N-30), 8 (N-30), 9 (N-30), 10 (N-30), 11 (N-30), Sec. 30, T. 20 S., R. 15 E.
American Petroleum Co., Nos. 18, 24, Sec. 30, T. 20 S., R. 15 E.
Nevada Petroleum Co., No. 6, Sec. 30, T. 20 S., R. 15 E.

The test to determine the depth at which fluid stands is to be made by withdrawing the tubing from the well, and after ten hours from the time the tubing is removed, measuring to the surface of the fluid, measurement to be witnessed by the Supervisor or a representative designated by him for that purpose. This test must be made at each well within sixty days from date hereof.

The measurement of amounts of oil and of water produced to be made by running all fluid from the well into a tank of not less than fifty barrels capacity. The flow into the tank to continue for twenty-four (24) hours, unless the flow is sufficient to fill the tank in less than twenty-four (24) hours, when a shorter period of time is permissible. At the end of the prescribed period of time the flow into the tank to be stopped and the total fluid measured. Such free water as may have settled to the bottom of the tank to be drawn off and the remaining fluid again measured and sampled to determine the amount of water held in suspension, as shown by proper test with centrifuge.

The measurements of amounts of oil and of water must be made at each well at least once a week during the sixty days following the date of this order. A written statement covering all these tests to be filed with the Supervisor at the end of sixty days from date hereof.

Details of the manner of making these tests and submitting statements of the results thereof to be subject to the approval of the Supervisor or a representative designated by him for that purpose.

SUPPLEMENT TO ORDER No. 1.

June 2, 1917.

To Creme Petroleum Company,
Peter tum Suden, Secretary,
Merchants National Bank Bldg.,
San Francisco, California.
Mr. Wm. L. McGuire, Crocker Bldg., San Francisco,
Mrs. Clara Curry, Tulare, California.

Supplementing and continuing "Order Number One, by the State Oil and Gas Supervisor, R. P. McLaughlin, dated February 13, 1917, relative to Creme Petroleum Oil Co. well number One, Section 30, T. 20 S., R. 15 E., M. D. B. & M., in the Coalinga Oil Field of California."

The various tests and measurements previously specified in the order have been completed as follows:

The depth to the top of the fluid in the various wells has been determined as specified. The amounts of oil and water pumped from the various wells has been determined as specified.

The prompt cooperation of the various companies and the complete records furnished are worthy of special mention.

A model has been constructed under the direction of the Supervisor and is now at the office of the Supervisor at Coalinga. Samples of the water pumped from various wells have been collected and analyzed under direction of the Supervisor.

The depth of fluid in Creme Petroleum Well No. 1 has also been determined by the Supervisor.

Comparison of all these data indicate that the damage complained of as originating in Creme Petroleum Well No. 1 affects only a portion of the wells previously enumerated in the order. The wells within the zone probably affected by the condition of Creme Petroleum Well No. 1, are as follows, all in Section 30, T. 20 S., R. 15 E., M. D. B. & M.

American Petroleum No. 9 (N30).
American Petroleum No. 10 (N30).
American Petroleum No. 11 (N30).
American Petroleum No. 12 (N30).
American Petroleum No. 18.
American Petroleum No. 24.
Nevada Petroleum No. 6.
Nevada Petroleum No. 7.
Creme Petroleum No. 1.
Creme Petroleum No. 2.

The result of pumping tests, fluid level measurements and water analysis is as follows:

	Barrels oil per day	Barrels water per day	Depth of fluid level	Analysis of water
American Petroleum, No. 9 (N-30)	5.0	497.0	1,507	Top.
American Petroleum, No. 10 (30)	46.6	17.4	2,130	No sample.
American Petroleum, No. 11 (30)	21.0	247.0	1,510	Top.
American Petroleum, No. 12 (30)				No sample, abandon.
American Petroleum, No. 18	5.3	315.0	1,378	Top.
American Petroleum, No. 24	67.0	124.0	1,232	Top.
Nevada Petroleum, No. 6	9.3	326.0	1,295	Top.
Nevada Petroleum, No. 7				No sample.
Creme Petroleum, No. 1			350	No sample, idle.

The highest fluid level is in Creme Well No. 1, the next highest fluid level is in the adjoining well, American Petroleum No. 24, and the fluid levels are lower as these wells are departed from in any direction. When American Well No. 24 was measured for fluid level no free water was found in the bottom of the well and the first pumping test produced almost no water, which indicated that it is not the source of the damaging water in surrounding wells.

Nevada Petroleum Well No. 7 is at present being repaired and has a plug between the oil sand and top water in such condition as to indicate that it is not flooding surrounding wells.

American Petroleum No. 11 (N30), while having a high fluid level, is separated from the other wells by a well having a low fluid level. The first showing of water in the well was gradual, indicating that it is not the source of the water. It may, in the future, require testing, but not until more probable sources of water have been eliminated.

The wells within the group herein mentioned showed marked increase of water in the following chronological order:

Creme Petroleum No. 1, July, 1912.
Nevada Petroleum No. 6, November, 1912.
American Petroleum No. 18, January, 1913.
American Petroleum No. 24, January, 1913.
Nevada Petroleum No. 7, April, 1913.
American Petroleum No. 9, June, 1913 (N30).
American Petroleum No. 11, March, 1914 (N30).
American Petroleum No. 10, July, 1914 (N30).

It appearing to the Supervisor that in his judgment certain repair work is necessary at Creme Petroleum Well No. 1 to protect the petroleum and gas deposits from damage by underground water;

Now, therefore, pursuant to Sections 8 and 11 of Chapter 718, Statutes of 1915, it is hereby ordered, that work be performed in accordance with either of the two methods herewith specified:

First: Redrill or open the well to a depth of 2425′, put in a shot between depths of 2415′ and 2425′, consisting of at least 75 lbs. and not more than 250 lbs. of 80% gelatin, again clean out well to a depth of 2425′ and if after inspection of work by the Supervisor and subsequent order from him to put in another shot of similar size and material at the same place; wash out hole by means of clear water, place cement plug between depths of 2425′ and 2415′; determine to the satisfaction of the Supervisor that said cement plug has properly set; put in additional cement in the hole sufficient to fill it up to a depth of about 2400′; leave sufficient casing in hole to act as a conductor from the ground surface to a depth of 2400′.

Second: Place a string of casing at a depth not greater than 2415′; cement said string of casing, and satisfy the Supervisor that casing prevents the passage of water to points below the bottom of casing.

Deputy Supervisor R. D. Bush is hereby authorized to inspect and approve all details of the forementioned work.

Analyses of Water From Wells Near Property of Creme Petroleum Company.
(Grains per Gallon Expressed as Sodium Salts.)

Company	Well number	Sec.	T.	R.	Total solids	Total carbonates	Total sulphates	Total chlorides
American Petroleum	1 (N-30)	30	20	15	478	172.8	Trace	272.0
	3 (N-30)	30	20	15	521	201.0	Trace	287.8
	8 (N-30)	30	20	15	478	178.5	Trace	277.0
	9 (N-30)	30	20	15	219	59.7	96.0	54.5
	10 (N-30)	30	20	15	338	153.7	36.8	114.0
	11 (N-30)	30	20	15	239	76.6	90.1	60.2
	18	30	20	15	218	44.9	110.6	53.8
	24	30	20	15	221	47.3	107.2	54.4
Nevada Petroleum	6	30	20	15	217	45.5	110.7	53.8
	8a	30	20	15	243	70.1	79.5	87.0
	1	20	20	15	249	94.7	Trace	119.4
Kern Trading & Oil	37	25	20	14	478	160.0	Trace	278.5
	40	19	20	15	297	91.6	Trace	163.0

Complaint No. 2.

Arizona Petroleum Company vs. *Strong Oil Company,* Section 14, Township 20 South, Range 14 East, M. D. B. & M.

A written complaint was received March 8, 1917, from the Arizona Petroleum Company, stating their belief that water was coming from the Strong Oil Company Well No. 1 or No. 2 into their Well No. 2. The Strong Oil Company was unable to furnish information as to the condition of all their wells, and particularly Well No. 2, the condition of which was doubtful, but agreed to erect a derrick, which had blown down, and investigate conditions in this well. With this understanding, no formal order was issued by the State Supervisor. Work was commenced at once, and, after finding that top water was not shut off, the $7\frac{5}{8}''$ casing was landed above the oil sand and is now ready for test.

The following cases were investigated upon receipt of informal complaints, or were initiated by this department in order to prevent a widespread flooding of water:

1. *Shell Company of California* vs. *Coalinga Midland Oil Company,* Section 10, Township 19 South, Range 15 East, M. D. B. & M.

On February 3, 1917, the Shell Company withdrew its offer to test out the Coalinga Midland well. On July 9, 1917, a proposal to plug and abandon the well was received from the Coalinga Midland Oil Company and was submitted by this department to the Shell Company for approval, but to date no reply has been received.

2. *Coalinga Homestake Oil Company* vs. *Caledonian Oil Company,* Section 26, Township 20 South, Range 14 East, M. D. B. & M.

On August 4, 1916, a complaint was received from the Coalinga Homestake Oil Company regarding Well No. 2 of the Caledonian Oil Company. The complaint was based on general water conditions on the Coalinga Homestake, with no definite proof as to its source. This department requested further particulars regarding recent work on Coalinga Homestake wells Nos. 3, 5 and 6, and on August 22, 1916, this was submitted. No definite information was at hand as to the condition of Caledonian Well No. 2, and an effort to obtain this from the owner was made, without success. On June 25, 1917, notice of setting a packer in the water string of Coalinga Homestake Well No. 5 was received, since it appeared that the well was making its own water to some extent. The well is now making some oil and apparently improving. In Well No. 6, tests were made of the water string, and at this time indicate that the water string is tight. Bottom water, which was once drilled into and plugged off, has possibly again broken in. However, it is probable that one or more of the Caledonian wells are flooding the oil sands.

3. Nevada Petroleum Well No. 1, Section 20, Township 20 South, Range 15 East, M. D. B. & M.

This well, as originally drilled, was deep enough stratigraphically to encounter bottom water, and produced water at first. While endeavoring to pull out the oil string, the derrick burned. After three months, some of the oil string was pulled out and a new one landed above the bottom sand, sidetracking 132′ of the old casing, which was not plugged, and which extends into the bottom sand. This sand was evidently plugged off in the old hole by sand and shale, as the well then produced clean oil for over five months, when, after a redrilling job, it produced 60% water, and has continued to pump a large quantity of water since then, which seriously affected the Southern Pacific Company's Well No. 40, Section 19. This matter had previously been under consideration by the Coalinga Water Arbitration Association, before the enactment of the present law, and the Nevada Petroleum Company had made unsuccessful attempts to shut off the water which was demonstrated, with very little doubt, to be bottom water, first by testing and eliminating the water string as a source, and, second, by chemical analysis. In May, 1917, the attention of the Nevada Petroleum Company was called to the fact that nothing was being done to remedy conditions, and immediate action was desired. Mr. Hardison, of the Nevada Petroleum Company, called a conference of five local operators to get their opinion of the best course of action to remedy the condition. The company then agreed to go ahead on the approved plan, which was also approved by this department.

PRODUCTION METHODS.

It is apparent that production practice of the Coalinga field has not reached as high an efficiency as is practicable. There are many properties that have made rapid strides in the right direction, but there is, in general, much to be done toward economical operation.

One of the properties that has made notable efforts to reduce production costs is the Inca Oil Company, located on the West Side in Section 24, T. 20 S., R. 14 E., M. D. B. & M. There are 34 wells producing on 160 acres, making an average of 4.7 acres per well, so that probably no further drilling is practicable. No new wells have been drilled since January, 1912. However, sand conditions are not yet entirely satisfactory, as the oil from about half of the wells has to be run into sumps for settlement.

The wells average about 475 barrels of clean oil per month, with a water content of 1.3%. The average proportional gravity is 13.5° Baumé, and the average depth of wells is 1060′, the shallowest being 824′ and the deepest 1290′. Many hundred feet of steam lines have been abandoned, and every producing well on the property is pumped by jacks operated by two power plants. These powers are located near the center of the west half of the property. A separate cable runs to each well, making a total footage of about 28,140. Each power is operated by a 50-horsepower gas engine with magneto ignition. The average stroke of rods resulting from the motion of the lines is 18″, and the speed is 12 strokes per minute.

The wells are pulled and repaired by using a 35-horsepower traction engine. This is run to the well and connection made with 12′ lengths of metallic hose from traction boiler to steam engines at the well. The traction boiler is jacketed, but its low efficiency is more or less offset by the short delivery line. The portable outfit can carry enough water to run over a half day, after which it is refilled with distilled water, which has been condensed from steam used in the cleaning plant. The outfit requires about 30 barrels water and 4 barrels fuel oil per 10 hours when bailing or running tools. There has been ordered a second 35-horsepower traction engine to facilitate the work. Superintendent F. A. Wells estimates that the total consumption of fuel oil will then be about 300 barrels per month. There are ten men on the pay-roll, and costs per barrel, exclusive of amortization of capital and interest charges, run about 17 cents. This is equivalent to an average cost of operation per well per day of $2.60, excluding the same items as above mentioned. It is evident that these figures do not include an item which is chargeable to perhaps the majority of oil properties, namely, the cost of drilling to maintain production, but, as the production has not been maintained and the amount of oil produced has become less, the operating costs per barrel have raised.

Although the Inca Oil Company has used this system to great advantage, it could not be applied successfully to all properties. The Inca property is fairly hilly, but there have been provided good enough roads so that it is easy to move the traction engine to make short connection with the engine at any well.

If a property is too rough for this procedure, it might be advisable, other conditions warranting, to construct one or more good roads to accommodate the tractor and use longer temporary steam lines to the wells.

Such items as surface contour, amount and gravity of oil, amount of sand and mud, amount of water, depth of wells, and gas pressure enter into the problem. However, when a group of wells has become more or less settled, it is probable that this idea could be profitably adopted after making suitable modifications to such local conditions.

THE USE OF MUD FLUID IN ABANDONMENT.

The American Petroleum Company recently abandoned Well No. 8, Section 19, T. 20 S., R. 15 E., M. D. B. & M., protecting the oil sands from water by the use of mud fluid, as suggested by this department, which is anxious to give the method thorough tests. The work was inspected and approved by this department, but its entire effectiveness must be demonstrated in the future by the production of surrounding wells.

The accompanying graphic log shows the lower portion of the well and its condition just previous to the last redrilling job and abandonment, the latter being decided upon after mechanical troubles made it doubtful whether the 8¼″ casing could be successfully recemented to shut out top water. The 10″ was originally the water string, and the well produced for several years from the sands below it. Later, edge water appeared in the upper sands and was shut off with the 8¼″ casing at 1885′.

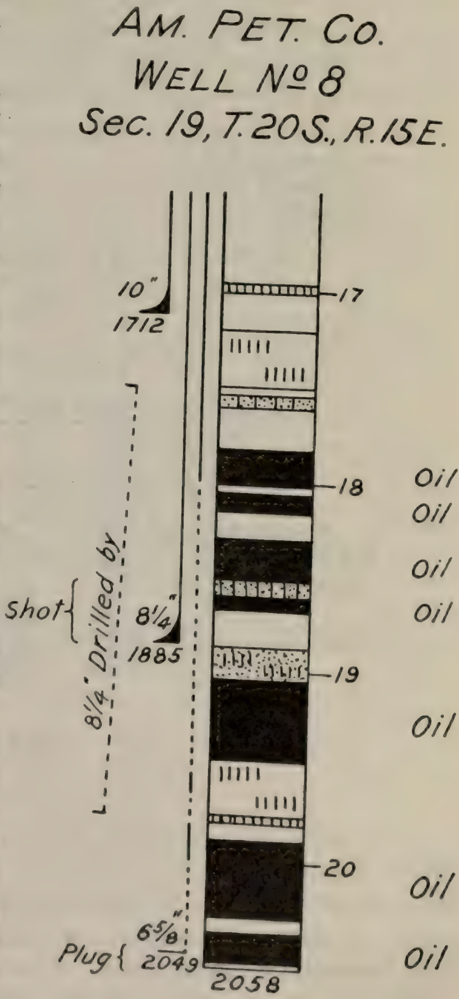


FIG. 27.

In preparation for the mudding and abandonment, 1864′ of 6⅝″ and 1826′ of 8¼″ casings were pulled out and the 8¼″ carried to 1980′ and the well cleaned out to 2004′. Mud fluid was obtained by mixing the surface formation, which was fairly good clay containing a small amount of fine grained sand, with water. A 40-horsepower boiler and Gumbo Buster pump was set some 900 feet from the well, where the mud was mixed by circulating the fluid through the pump and discharging it through a hose into the 50′x 75′ shallow reservoir made by plowing the ground and banking up the sides. The sand settled out to a great extent before the fluid reached the suction box at the pump. By adjusting the valves, the pump discharged directly into the top of the 8¼″ casing at the well through a 2″ pipe line. The work at this plant was attended to by one man, with occasionally an extra helper, and the work at the well by two drilling crews of two men each.

No figures are available as to the yards of material pumped into the well, but some idea may be gained by an estimate of the time during which mud was being introduced into the well. The total time consumed in mudding, moving casing, plugging, cleaning out, etc., was forty-six days of twenty-four hours, and on every day except six mud was pumped into the well a portion of the time, occasionally with the 2″ valve wide open, but generally barely open, allowing just enough fluid to run in to keep the hole full, but not running over, between the 8¼″ and 10″ casings. In that manner the oil sands took all the mud put in, the quantity generally decreasing, until the hole stood full under the hydrostatic pressure only. A casing head was then put on with packing clamps between the 8¼″ and 10″ casings and more mud pumped in until the pressure was up to 200 lbs. and fell only 20 lbs. in one hour.

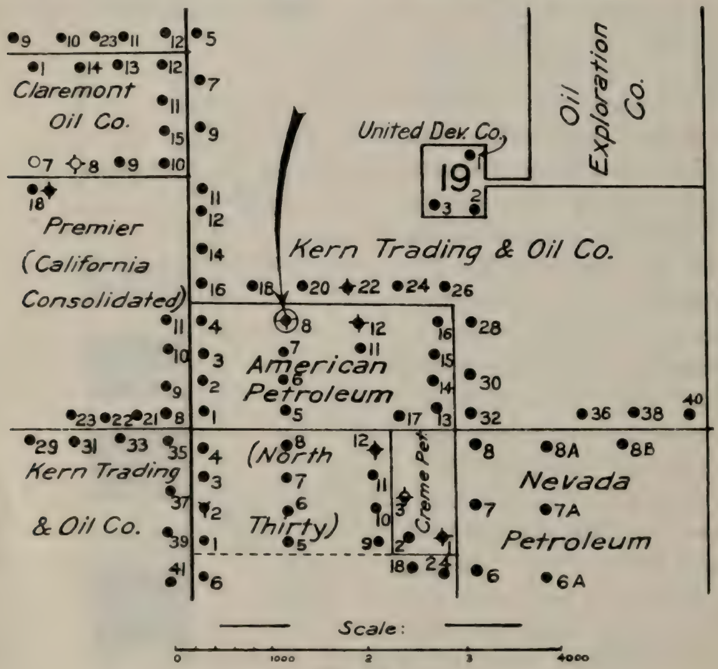


FIG. 28.

For the first sixteen days the 8¼″ casing was kept at 1927′ and the sand at that point mudded first, until it required pump pressure to force mud into the well. The casing was then lowered to 1976′ and the sands below 1990′ mudded in the same manner. Plugs of brick and rope were then put in from 2004′ to 1949′. The casing was then pulled up to 1784′ and the upper sands mudded under pressure.

During the first portion of the work, the mud fluid was rather thin, so that the mud would be deposited in the sand voids for a considerable distance from the well, thus building up an artificial body of clay around the well, which should be impervious to water. As the sands became clogged with mud, the fluid was thickened and the final column of fluid standing in the well to the surface is of maximum density and its hydrostatic pressure greater than the water in any stratum of sand, and thus should confine all waters to the sands in which they occur.

Evidence that the mud fluid traveled away from the well when the fluid was thin is had from the fact that muddy water on the fifth day appeared in succession in the production of wells Nos. 7, 6 and 5, being more pronounced in the nearest one, No. 7, distant 332′, and least in No. 5, distant 1000′, and discontinued after the fluid was thickened and required pump pressure to force it into Well No. 8.

Sixty days after completion of the work, improvement in the production of the three above mentioned wells is shown by the following comparison:

	Average daily production at completion of work		Average daily production 60 days after completion of work	
	Barrels oil	Barrels water	Barrels oil	Barrels water
Well No. 7	16	418	19	219
Well No. 6	12	187	22	190
Well No. 5	12	373	19	249
Totals	40	978	60	658

PACKING HEAD FOR USE WITH MUD FLUID.

The recent extensive use of mud fluid in protecting oil sands from water and in forcing cement or mud into the formation under pressure have brought into use a number of appliances used to shut in the fluid and prevent circulation between the conductor casing and the movable casing which may be intended for an oil string, or a water string to shut off oil and water sands together. Among these appliances is a "packing head," perfected and used extensively by the fuel oil department of the Southern Pacific Company in this field. The accompanying drawing and photographs show its construction in detail and its general appearance.

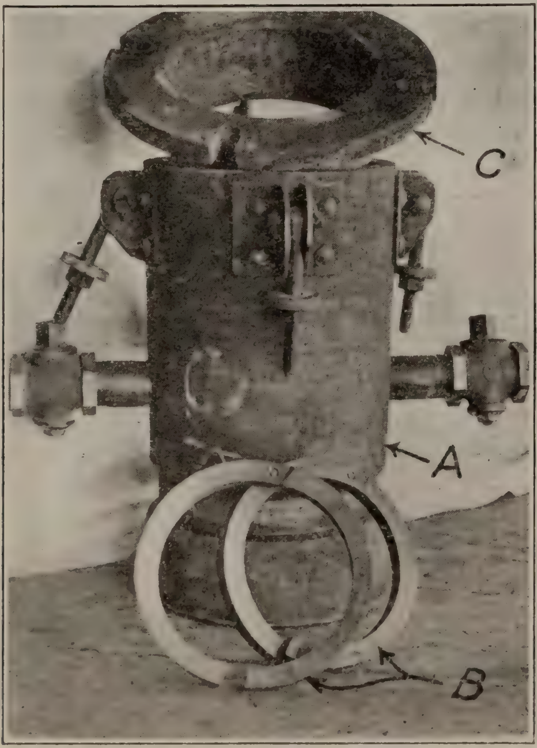


FIG. 29.

The packing head (A) shown is constructed to pack off between 8¼" and 6¼" casings and is screwed into the collar of the top joint of 8¼". The split packing rings (B) are put around the 6¼" casing and inside the head, the lower one resting on the shoulder and having about 6" of packing between them. The packing head sleeve (C) is put in, bearing on the top packing ring, and bolted down, packing the space between the casings tight enough to withstand a pressure of 1000 lbs. per square inch or more.

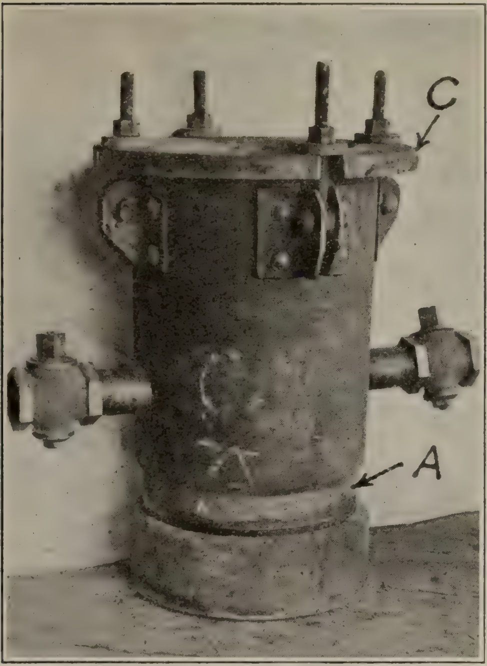
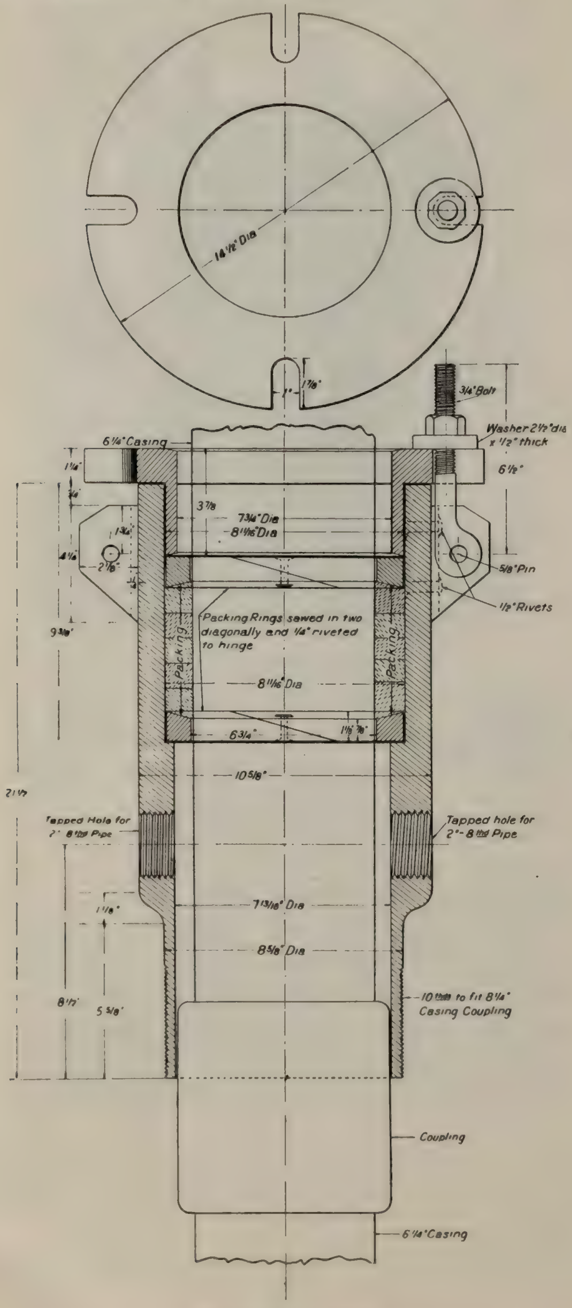


Fig. 30.

It is generally necessary to keep the inside string of casing loose by moving it frequently, and with the packing head this can be done without shutting the pump down or releasing the pressure, and the casing can be moved at any time a distance of 20′, between two couplings. If it becomes necessary to move the casing more than 20′, the pressure must be released and the packing head sleeve and rings removed, and the casing can then be raised or lowered the desired distance, the inside diameter of the head being sufficient to allow the passage of a coupling.

By means of the side outlets and valves, the pressure can be regulated or circulation maintained, as desired, and the whole operation can be conducted with a great saving of time and labor over the former method of using ordinary gas clamps and depending on the weight of the casing to make the packing tight. The packing head can also be used as a casing head for high pressure gas after the well is completed. A coupling on the oil string is either landed on the packing head sleeve, or the sleeve modified to take slips and hold the casing at any point on the top joint.

A packing head of the size shown in the drawing can be made at any machine shop at a cost of about $80, and other sizes approximately in proportion to the amount of steel used.


14½" Dia
1"
1⅞"
3/4" Bolt
Washer 2½" dia x ½" thick
6½"
6¼" Casing
1¼"
¾
3⅞
7¾" Dia
8 11/16" Dia
1¾"
4⅛"
2⅞"
5/8" Pin
½" Rivets
9⅜"
Packing Rings sawed in two diagonally and ¼" riveted to hinge
Packing
Packing
8 11/16" Dia
6¾"
1⅛" ⅞"
10⅝"
21½
Tapped Hole for 2" 8 thd Pipe
Tapped hole for 2"-8 thd Pipe
7 13/16" Dia
1⅛"
8⅝" Dia
8½"
5⅝"
10 thd to fit 8¼" Casing Coupling
Coupling
6¼" Casing

PACKING HEAD

PROVIDING FOR MOVEMENT OF 6¼" CASING WITHIN 8¼" CASING WHILE MAINTAINING PRESSURE BETWEEN THEM

(SOFT STEEL FINISHED ALL OVER)

SCALE OF INCHES

FIG. 31.

DECISIONS.

T. 12 S., R. 20 E., M. D. B. & M.

SECTION 17.

F. A. Rife & Co.

Well No. 1, drill new. AA-392.

A "wild cat" well near Clovis. It was recommended that the company notify this Department in case oil indications were found and that the company make a written report of test of water shut-off.

Exact information as to elevation and location was requested.

T. 12 S., R. 21 E., M. D. B. & M.

SECTION 18.

C. J. Heyler.

Well No. 1, commence drilling. AA-384.

A "wild cat" well near Clovis. It was recommended that the company notify this Department in case oil indications were found and that the company make a written report of test of water shut-off.

T. 18 S., R. 15 E., M. D. B. & M.

SECTION 27.

Standard Oil Co.

Well No. 1 (Domengine), abandon. AA-274.

When abandonment proposal was filed, well was plugged 4200–2600′. Company proposed to do additional plugging above 2600′. An investigation made by this Department showed that no oil or gas formations were encountered in this well. In view of this fact a decision was rendered stating that further plugging would not be required.

T. 19 S., R. 15 E., M. D. B. & M.

SECTION 2.

Imperial Oil Co.

Well No. 6, commence drilling. AA-257.

Approved proposed water shut-off at 2850′.

Well No. 6, shut-off. A-219.

Ten-inch cemented at 2773′. Water not shut off. Recommended cementing 8¼″ at about 2875′. However, company did not carry out this recommendation and cemented at 2810′, failing to shut off water.

Well No. 6, cement deeper. AA-515.

After shut-off with 8¼″ failed at 2810′, approved proposal to cement 8¼″ at 2817′.

Well No. 6, redrill. AA-564.

Shut-off at 2817′ failed. Approved proposal to cut out 2450′ of 8¼″ and cement 6¼″ at about 2840′.

Well No. 6, deepen. AA-597.

Approved proposal to cement 6¼″ at 2860′ after plugging oil sand found below.

Well No. 6, shut-off. A-338.

Shut-off tested. Hole not open into formation below cement bridge. Recommended drilling ahead into formation for another test.

Well No. 6, shut-off. A-340.

Well was cleaned out to a depth of 2875′ and test of water shut-off with 6¼″ at 2860′ was approved.

General Petroleum Corp.

Well No. 15, commence drilling. AA-594.

Proposed depth of water shut-off approved.

Well No. 15, shut-off. A-355.

Test of water shut-off satisfactory.

Well No. 32, commence drilling. AA-573.

Recommended water shut-off at 2227′, instead of 2270′ as proposed, in order to be above an oil sand open in neighboring wells.

Well No. 32, commence drilling. AA-575.

Corrected depth of water shut-off on account of new data on location of well.

Well No. 32, shut-off. A-334.

Test satisfactory.

Well No. 33, commence drilling. AA-645.

Approved proposed depth of water shut-off.

SECTION 10.

Shell Co. of California.

Well No. 7, shut-off. A-178.

Test satisfactory. Recommended deepening 20′ and make further test.

Well No. 7, abandon. AA-350.

Company proposed to clean out to 1265′ and rip, shoot, and plug with cement to 1150′. This Department recommended well be cleaned out to original bottom, 1435′, and plugged from this depth in the manner proposed.

Well No. 7, abandon. AA-358.

Confirming Report No. AA-350, pointing out that well was originally drilled to 1435′, leaving unplugged casing, and bottom was not at 1265′ as considered by the company.

Well No. 8, abandon. AA-406.

Proposed method of abandoning not entirely approved.

Recommended additional shooting and plugging.

SECTION 11.

Kern Trading and Oil Co.

Well No. 12, redrill. AA-235.

Approved proposal to replace collapsed oil string, using screen pipe on bottom.

Well No. 51, commence drilling. AA-650.

Recommended water shut-off at 1879′, instead of 1895′ as proposed.

Well No. 52, commence drilling. AA-651.

Recommended water shut-off at 2030′, instead of 2050′ as proposed.

Well No. 53, commence drilling. AA-652.

Recommended water shut-off at 2195′, instead of 2215′ as proposed.

SECTION 14.

Shell Co. of California.

Well No. 6, redrill to 1510′ and test. AA-368.

Recommended that company make casing test, drill out cement plug to 4′ below shoe, or to 1448′, and test well at this depth.

Well No. 6, redrill and plug. AA-395.

Company found small quantity of water after drilling 1′ below water string. Approved proposal to redrill to 1550′, plug to 1505′, and test by pumping.

Well No. 6, abandon. AA-415.

Previous tests did not determine the exact source of the water. Proposal to abandon was approved, recommending that sufficient casing be left in to act as a conductor to 1405′, so that well could be re-entered and additional work done, if necessary.

Well No. 6, perforate for water. AA-543.

Approved proposal to plug bottom of 12½″ casing and perforate for water.

Shell Co. of California.

Well No. 11, abandon. AA-524.

Proposed work of abandonment not approved until bottom water was successfully shut off.

Well No. 14, redrill. AA-623.

Proposal to plug for bottom water by simply ripping and plugging with cement inside of casing. Recommended shooting before plugging.

Well No. 14, redrill. AA-640.

Supplementing Report No. AA-623, approving ripping only before plugging, providing ripping was done so that hole could be cleared of iron and plugged in formation.

Well No. 16, deepen. AA-234.

Approved proposal to deepen.

Well No. 16, deepen. AA-314.

Approved proposal to plug bottom to determine possible source of water which entered well after deepening.

Well No. 16, plug bottom. AA-383.

Approved proposal to do additional plugging in lower portion of well.

Well No. 16, redrill. AA-449.

Approved proposal to insert 4½″ screen liner to relieve sand trouble.

Well No. 17, deepen. AA-362.

Proposal to deepen approved.

Well No. 17, deepen. AA-413.

Approved proposal to deepen from 2215′ to about 2260′.

Well No. 19, deepen. AA-316.

Approved proposal to deepen from 2405′ to 2415′.

Well No. 19, deepen. AA-435.

Approved proposal to deepen from 2415′ to 2460′.

Well No. 19, redrill. AA-641.

Approved proposal to rip and plug in bottom. Recommended that sufficient ripping and cleaning out be done to entirely clear the hole of casing at the point of plugging.

Well No. 19, plug casing. AA-663.

Approved proposal to plug bottom of well with cement inside of casing without ripping or shooting. Called attention to the fact that water may come up outside of casing.

Well No. 21, commence drilling. AA-476.

Proposed depth of water shut-off approved.

Well No. 22, commence drilling. AA-475.

Proposed depth of water shut-off approved.

Well No. 23, commence drilling. AA-440.

Proposed depth of water shut-off approved.

Well No. 23, shut-off. A-328.

Approved test of water shut-off as satisfactory.

Well No. 23, redrill. AA-632.

Approved proposal to put in screen liner.

Well No. 24, commence drilling. AA-436.

Approved proposed depth of water shut-off.

Well No. 24, shut-off. A-280.

Test showed that sand had heaved into water string with 1640′ of oil and no free water. Recommended the company drill into the oil sands and make a production test.

Well No. 24, shut-off. A-329.

Production test showed water to be shut off.

Well No. 25, commence drilling. AA-471.

Proposed depth of water shut-off approved.

Well No. 25, shut-off. A-306.

Test of water shut-off satisfactory.

Shell Co. of California.

Well No. 25, redrill. AA-631.

Approved proposal to land screen liner.

Well No. 26, commence drilling. AA-529.

Recommended water shut-off 40′ deeper than proposed, pending report of depth to "red rock."

Well No. 26, shut-off. A-352.

Test of water shut-off satisfactory.

Well No. 27, commence drilling. AA-530.

Proposed depth of water shut-off approved.

Well No. 27, shut-off. A-330.

Test of water shut-off satisfactory.

Well No. 28, commence drilling. AA-552.

Proposed depth of water shut-off approved.

Well No. 29, commence drilling. AA-627.

Proposed depth of water shut-off approved.

SECTION 20.

Standard Oil Co.

Well No. 1, deepen. AA-343.

Approved proposal to deepen.

Well No. 1, shut off "bottom" water. AA-482.

Approved proposal to plug bottom in order to shut off water encountered in deepening.

Well No. 9 (Coalinga Oil Co.), redrill. AA-213.

Notice of intention to redrill was not received prior to commencement of work. Recommended that the company keep this Department informed of new developments during the drilling, particularly if well is to be deepened or water shut off.

Well No. 22, commence drilling. AA-341.

Approved proposed depth of water shut-off.

Well No. 23, commence drilling. AA-342.

Approved proposed depth of water shut-off.

SECTION 21.

Shell Co. of California.

Well No. 10, redrill. AA-493.

Proposal to pull 8½″ casing approved. Recommended the company plug lower portion of 10″ casing before removing upper portion of casing and that well be plugged in formation just below 12½″ before perforating this casing for test of upper sands.

SECTION 22.

Record Oil Co.

Well No. 12, shut-off. A-160.

Approved test of water shut-off with 10″ casing of 1674′.

Well No. 12, deepen. AA-244.

An investigation by this Department showed a serious water condition existed in this territory, and, in order to locate the source of the water and remedy this condition, if possible, approval was given to deepen and test each sand to locate probable intermediate water; to cement below water sand, using sufficient cement to protect upper formations. This proposal was called to the attention of neighboring operators before approval was given.

Well No. 12, redrill and deepen. AA-491.

Eight and one-quarter-inch cemented at 1860′ failed to shut off water. Rejected proposal to cement another string of 8¼″ at 1863′ before shooting 8¼″ sidetracked between 1775′ and 1860′.

Standard Oil Co.

Well No. 23, commence drilling. AA-553.

Proposed depth of water shut-off approved.

Well No. 23, shut-off. A-343.

Test of water shut-off satisfactory.

Good Luck Oil Co.

Well No. 6, abandon. AA-483.

Approved proposal to plug lower portion of well, specifying the depths at which plugging and testing should be done.

Well No. 6, abandon. AA-600.

After certain plugging had been done and tests made it was found advisable to supplement Report No. AA-483, stating that certain additional plugging required therein was not necessary.

Well No. 6, shut-off. A-346.

Test of water shut-off satisfactory.

Shell Co. of California.

Well No. 2, redrill (plug bottom). AA-461.

Approved proposal to redrill and plug.

Well No. 9, commence drilling. AA-470.

Approved proposed depth of water shut-off.

Well No. 10, redrill. AA-591.

Approved proposal to land liner.

Coalinga Peerless Co.

Well No. 21, shut-off. A-151.

Approved test of water shut-off.

Well No. 22, commence drilling. AA-295.

Approved proposed depth of water shut-off.

Well No. 22, shut-off. A-247.

Test of water shut-off satisfactory.

SECTION 26.

Shell Co. of California.

Well No. 2, redrill. AA-508.

Approved proposal to put in 4½" casing with packer.

Well No. 3, reperforate. AA-615.

Approved proposal to do additional perforating.

Well No. 13, shut-off. A-194.

Test of water shut-off approved.

Well No. 13, deepen. AA-278.

Approved proposal to deepen to brown shale.

Well No. 13, perforate. AA-612.

Approved proposal to do additional perforating of oil string.

Well No. 14, shut-off. A-150.

Test of water shut-off approved.

Well No. 14, deepen. AA-288.

Approved proposal to deepen to brown shale.

Well No. 14, plug bottom. AA-371.

Approved proposal to plug one sand at a time until water was shut off.

Well No. 14, shut-off. A-261.

After bottom had been plugged, a production test showed water entirely off.

Well No. 16, shut-off. A-208.

Test of water shut-off satisfactory.

Well No. 19, deepen and redrill. AA-451.

Approved proposal to redrill and deepen to brown shale.

Well (Metropolis) No. 21, redrill and deepen. AA-450.

Approved proposal to make pumping test to determine water condition, and recement 6¼" casing, if necessary. Recommended company clean well out to original depth, 3265′, and make production test before deepening.

Shell Co. of California.

Well (Metropolis) No. 21, redrill and deepen. AA-450 Supp.

Recommended that if test of 6¼″ was satisfactory the company deepen to 3310′ as originally proposed.

Well (Metropolis) No. 21, make bailing test. AA-473.

Approved proposal to test by bailing, instead of pumping as originally proposed.

Well (Metropolis) No. 21, abandon. AA-633.

Proposal to abandon approved. Designated depths at which plugging should be done.

Well No. 22, commence drilling. AA-469.

Proposed depth of water shut-off approved.

Well No. 22, shut-off. A-310.

Test of water shut-off satisfactory.

Well No. 23, commence drilling. AA-502.

Proposed depth of water shut-off approved.

Well No. 23, shut-off. A-337.

Test of water shut-off satisfactory.

Well No. 24, commence drilling. AA-527.

Proposed depth of water shut-off approved.

Well No. 24, shut-off. A-350.

Test of water shut-off satisfactory.

Well No. 25, commence drilling. AA-599.

Proposed depth of water shut-off approved.

Well No. 26, commence drilling. AA-620.

Proposed depth of water shut-off approved.

Well No. 27, commence drilling. AA-634.

Proposed depth of water shut-off not approved. Recommended 35′ higher.

SECTION 27.

Well No. 13, deepen. AA-481.

Approved proposal to deepen to brown shale.

Well No. 14, deepen. AA-480.

Approved proposal to deepen to brown shale.

Well No. 23, redrill and deepen. AA-233.

Approved proposal to redrill and deepen well about 40′.

Well No. 45, redrill. AA-487.

Approved proposal to remove upper portion of oil string.

Well No. 46, redrill. AA-356.

Approved proposal to perforate 6⅝″ casing.

Well No. 47, redrill. AA-486.

Approved proposal to pull out 6⅝″ casing which was hanging in well above top of liner.

Well No. 54, redrill. AA-313.

Approved proposal to redrill and deepen about 40′ in order to make further test.

Well No. 54, shut-off. A-216.

Test was made with 6¼″ casing landed at 1753′, 53′ below water string with one joint of screen pipe on bottom, solid pipe above. Test indicated that water was excluded from below 1733′, but it was recommended that production test be made ninety days after completion. The production report after ninety days showed that the well made thirty barrels of oil and thirty-four barrels water per day. The source of this water has not been determined.

Well No. 54, redrill. AA-357.

Approved proposal to redrill and deepen to brown shale.

Well No. 55, shut-off. A-157.

Bailing test satisfactory. Production test recommended after sixty days.

Well No. 55, deepen. AA-248.

Approved proposal to deepen to brown shale.

Shell Co. of California.

Well No. 71, redrill. AA-365.

Proposal to cement 8¼″ at 1650′ was rejected as being below sands from which some neighboring wells are producing. Proposal to remove 10″ casing was also rejected on account of permitting probable entrance of water into upper oil sands.

Well No. 71, redrill. AA-378.

The revised proposal to cement 8¼″ between 1595′ and 1620′ was approved. Also approved proposal to fill space between 10″ and 12½″ with cement, leaving a 50′ lap of 10″ into 12½″. The records do not show that cement was put between 10″ and 12½″ as proposed.

Well No. 71, shut-off. A-244. Test of water shut-off satisfactory.

Well No. 76, cut and pull oil string. AA-509.

Proposal to cut out portion of oil string approved.

Well No. 78, redrill. AA-287.

Approved proposal to plug below bottom of 10″ and into 10″ and perforate oil sands which were shut off.

Well No. 78, shut-off. A-253.

Production test showed that water was shut out of upper sands.

Well No. 78, cut out and pull oil string. AA-510.

Proposal to remove upper portions of oil string approved.

Well No. 79, commence drilling. AA-496.

Proposed depth of water shut-off approved.

Well No. 79, shut-off. A-322.

Test of water shut-off not approved. Three tests were made and a small quantity of water found to be entering the well. Recommended the well be deepened about 10″ and the source of water determined.

Well No. 79, cement deeper. AA-642.

Approved proposal to mud off upper oil sands and cement below possible intermediate water.

Well No. 80, commence drilling. AA-307.

Proposed depth of water shut-off approved.

Well No. 80, shut-off. A-249.

Test of water shut-off satisfactory.

Well No. 81, commence drilling. AA-308.

Proposed depth of water shut-off approved.

Well No. 81, shut-off. A-262.

Test of water shut-off satisfactory.

Well No. 82, commence drilling. AA-398.

Proposed depth of water shut-off approved.

Well No. 82, shut-off. A-274.

Test of water shut-off satisfactory.

Well No. 83, commence drilling. AA-536.

Proposed depth of water shut-off approved.

Well No. 83, shut-off. A-324.

Test of water shut-off satisfactory.

Well No. 84, commence drilling. AA-558.

Proposed depth of water shut-off approved.

Well No. 84, shut-off. A-333.

Test showed a small leak. Recommended completion of well, after which a production test would be made.

Well No. 84, cement deeper. AA-639.

Approved proposal to mud off upper oil sands and cement below possible intermediate water.

Well No. 85, commence drilling. AA-593.

Proposed depth of water shut-off approved.

Well No. 86, commence drilling. AA-605.

Canceled and replaced by subsequent notice.

SECTION 28.

Standard Oil Company.

Well No. 46, deepen. AA-219.

A notice that well was deepened and 6⅝″ liner ripped was received after work was done. Recommended that company submit proposals hereafter before work is commenced.

Well No. 78, abandon. AA-434.

Approved proposal to shoot and plug with cement the lower portion of the well.

Well No. 91, redrill. AA-394.

Approved proposal to shoot and plug in order to shut off "bottom water."

Well No. 97, shut-off at about 2730′. AA-258.

The proposal to cement 10″ casing at about 2730′ provided no oil sands were encountered above, was approved. It was recommended that certain information relative to plugging and shooting on the company's neighboring wells be filed.

Well No. 97, shut-off. A-207.

Test of water shut-off approved as satisfactory.

Well No. 105, commence drilling. AA-587.

Proposal to drill this well for the deep sands below the brown shale. The shut-off points above and below the upper oil sands approved. Recommended that this department be notified for tests of both cement jobs.

SECTION 29.

Shell Company of California.

Well No. 3, redrill. AA-372.

Approved proposal to redrill in order to locate water. Recommended that company plug up to 2425′ as proposed, and, if found necessary, shoot and plug in the formation above this point.

Well No. 3, abandon. AA-511.

Proposal to abandon approved, recommending additional shooting and plugging.

Well No. 4, abandon. AA-512.

Proposal to abandon approved, after shooting and plugging, instead of ripping and plugging as proposed.

Well No. 6, test by pumping. AA-262.

Approved proposal to drill well into first sand below shut-off point and make production test.

Well No. 6, shut-off. A-173.

The well was given a bailing test, and it was recommended that a further test be made to determine, if possible, the source and amount of water entering the well.

Well No. 6, shut-off. A-186.

A production test showed that the well made 17% water. A proposal to deepen the well was approved, and it was recommended that a production test be made thirty days after completion.

Well No. 6, test for water. AA-329.

A notice was received from the company stating that well had been plugged in the bottom. The proposal to perforate the sands above the plug was approved, in order to locate, if possible, the source of the water.

Well No. 6, redrill. AA-474.

Approved proposal to drill out the upper 5′ of the plug which had been placed in the bottom of the well.

Well No. 6, shut-off. A-272.

A production test showed that water was excluded from the formations between depths of 2693′ and 2785′. There is no data at hand to show that oil sands recorded between depths of 2828′ and 2850′ have been protected from water.

Well No. 6, continue drilling. AA-559.

The company notified that the lower portion of the water string had been drilled off and proposed to complete redrilling. Proposal approved and recommended that pumping test be made after completion.

SECTION 31.

Associated Oil Co.
Aztec New No. 3, commence drilling. AA-556.
Proposed depth of water shut-off approved.
Well No. 21, commence drilling. AA-401.
Proposed depth of water shut-off approved.
Well No. 21 (Aztec), commence drilling. Supp. to AA-401.
Revised proposal to shut off water at a lower depth was approved.
Well No. 21 (Aztec), shut-off. A-307.
Test of water shut-off satisfactory.
Aztec No. 21, redrill. AA-630.
Approved proposal to plug off bottom water.
Aztec No. 22, commence drilling. AA-555.
Proposed depth of water shut-off approved.
Well No. 22, shut-off. A-345.
Test of water shut-off satisfactory.
Aztec No. 32 (Old No. 2), redrill. AA-478.
Approved proposal to pull out collapsed oil string and redrill the well.

Maine State Oil Co.
Well No. 8, redrill. AA-243.
Approved proposal to redrill on account of collapsed oil string.
Well No. 9, abandon. AA-403.
Approved proposal to remove oil string and plug in formation below and into water string and perforate water string for a water well.
Well No. 12, commence drilling. AA-429.
The proposed depth of water shut-off approved.
Well No. 12, shut-off. A-292.
Test of water shut-off satisfactory.
Well No. 13, commence drilling. AA-535.
Proposed depth of water shut-off approved.
Well No. 13, shut-off. A-351.
Test of water shut-off uncertain.

Commercial Petroleum Co.
Well No. 5, redrill. AA-407.
Approved proposal to redrill well on account of collapsed oil string.

Confidence Oil Co.
Well No. 5, redrill. AA-592.
Approved proposal to remove upper portion of oil string.

SECTION 32.

Pantheon Oil Co.
Pantheon No. 1, commence drilling. AA-638.
Proposed depth of water shut-off approved.
Pantheon No. 1, commence drilling. AA-648.
Proposal to shut off water 55′ deeper than originally proposed approved.

Associated Oil Co.
Pantheon No. 21, begin drilling. AA-517.
Recommended that company shut off water 35′ higher than proposed.

Pantheon Oil Co.
Well No. 21, shut-off. A-323.
Test of water shut-off satisfactory.
Pantheon No. 22, commence drilling. AA-667.
Recommended that company shut off water 13′ higher than proposed.
Pantheon No. 31, commence drilling. AA-669.
Proposed depth of water shut-off approved.

Pantheon Oil Co.
  Pantheon No. 32, commence drilling. AA-668.
    Recommended that company shut off water 27′ higher than proposed.
  Pantheon No. 33, commence drilling. AA-576.
    Proposed depth of water shut-off approved.
  Well No. 51 (old No. 3), redrill. AA-454.
    This well had not penetrated the oil sand. Approved proposal to sidetrack lower portion of the former water string and cement the well at a lower depth.
  Pantheon No. 51 (old No. 3), abandon. AA-519.
    Approved proposal to abandon.
  Well No. 51, commence drilling. AA-607.
    Recommended company shut off water 24′ higher than proposed.

Coalinga Empire Co.
  Well No. 2, shut-off. A-195.
    Test of water shut-off approved as satisfactory.

SECTION 33.

Kern Trading & Oil Co.
  Well No. 39, abandon. AA-285.
    Approval was given to plug and abandon the well as outlined in the notice, leaving conductor casing from surface to the top of the oil sand.
  Well No. 40, redrill. AA-479.
    Approved proposal to redrill well on account of collapsed oil string.
  Well No. 40, redrill. AA-635.
    Approved proposal to replace collapsed oil string.
  Well No. 239, commence drilling. AA-430.
    Proposed depth of water shut-off approved.

SECTION 34.

Shell Company of California.
  Well No. 2, shut-off. A-177.
    Test of water shut-off satisfactory.
  Well No. 2, deepen. AA-291.
    Proposal to deepen to brown shale approved.
  Well No. 5, shut-off. A-179.
    Test of water shut-off satisfactory.
  Well No. 5, deepen. AA-292.
    Approved proposal to deepen well to brown shale.
  Well No. 7, redrill. AA-346.
    Approved proposal to remove upper portion of oil string.
  Well No. 8, redrill. AA-344.
    Approved proposal to remove upper portion of oil string.
  Well No. 8, redrill. AA-364.
    Approved proposal to do additional perforating of oil string.
  Well No. 8, redrill. AA-442.
    Approved proposal to redrill on account of collapsed oil string.
  Well No. 8, redrill. AA-548.
    Approved proposal to put in liner.
  Well No. 9, redrill. AA-340.
    Approved proposal to remove upper portion of oil string.
  Well No. 10, redrill. AA-339.
    Approved proposal to remove upper portion of oil string.
  Well No. 11, shut-off. A-172.
    A bailing test reported by the company was approved, but, on account of sand heaving into the water string, a production test was recommended sixty days after completion.
  Well No. 11, redrill. AA-268.
    Approved proposal to redrill and deepen to brown shale.

Shell Co. of California.

Well No. 13, redrill. AA-348.

Approved proposal to do additional perforating and to remove upper portion of oil string.

Well No. 14, redrill. AA-337.

Approved proposal to remove upper portion of oil string.

Well No. 15, redrill. AA-338.

Approved proposal to remove upper portion of oil string.

Well No. 16, redrill. AA-336.

Approved proposal to remove upper portion of oil string.

Well No. 19, redrill. AA-345.

Approved proposal to do additional perforating of oil string.

Well No. 20, redrill. AA-335.

Approved proposal to remove upper portion of oil string.

Well No. 20, redrill. AA-363.

Approved proposal to do additional perforating of oil string.

Well No. 21, redrill. AA-347.

Approved proposal to do additional perforating of oil string and remove upper portion of same.

Well No. 22, redrill. AA-269.

Approved proposal to redrill on account of collapsed oil string.

Well No. 29, deepen. AA-232.

Approved proposal to deepen to brown shale.

Well No. 29, perforate. AA-613.

Approved proposal to do additional perforating of oil string.

Well No. 31, shut-off. A-167.

Test of water shut-off approved.

Well No. 32, commence drilling. AA-397.

Proposed depth of water shut-off approved.

Well No. 32, shut-off. A-264.

Test of water shut-off satisfactory.

Well No. 33, commence drilling. AA-497.

Proposed depth of water shut-off approved.

Well No. 33, shut-off. A-311.

Test of water shut-off satisfactory.

Well No. 34, commence drilling. AA-525.

Proposed depth of water shut-off approved.

Well No. 34, shut-off. A-326.

Test of water shut-off satisfactory.

Well No. 35, commence drilling. AA-589.

Recommended that company shut off water 20′ higher than proposed.

Well No. 36, commence drilling. AA-646.

Proposed depth of water shut-off approved.

SECTION 35.

Kern Trading & Oil Co.

Well No. 3, commence drilling. AA-421.

Proposed depth of water shut-off approved.

Well No. 3, shut-off. A-319.

Test of water shut-off satisfactory.

Well No. 13, abandon. AA-447.

The proposal to abandon the well was approved after certain tests had been made. The first test was to determine water condition of the well and additional tests after certain plugging had been done.

Well No. 22, shut-off. A-241.

Test of water shut-off approved as satisfactory.

Well No. 22, redrill. AA-443.

The notice stated that water string had accidentally been shot off. Approval was given to recement at the same depth as formerly.

Kern Trading & Oil Co.
Well No. 22, shut-off. A-291.
Test of water shut-off approved.
Well No. 22, redrill. AA-567.
Approved proposal to plug off bottom water.
Well No. 25, commence drilling. AA-459.
Proposed depth of water shut-off approved after receipt of supplementary notice.
Well No. 25, shut-off. A-347.
Test of water shut-off satisfactory.
Well No. 26, commence drilling. AA-460.
Proposed depth of water shut-off approved after receipt of supplementary notice.
Well No. 30, abandon. AA-419.
Proposed method of abandonment approved.
Well No. 33, commence drilling. AA-532.
Proposed depth of water shut-off approved.
Well No. 35, commence drilling. AA-531.
Recommended that company report depth to red rock for purpose of checking proposed depth of water shut-off.
Well No. 35, shut-off. A-354.
Test of water shut-off satisfactory.
Well No. 37, commence drilling. AA-664.
Notice received after well was cemented. The depth of water shut-off probably too deep.
Well No. 38, commence drilling. AA-665.
Proposed depth of water shut-off approved.
Well No. 41, commence drilling. AA-653.
Recommended that company shut off water 55′ above the point proposed.
Well No. 44, commence drilling. AA-654.
Recommended that company shut off water 28′ above the point proposed.
Well No. 45, commence drilling. AA-655.
Recommended that company shut off water 23′ above the point proposed.
Well No. 71, commence drilling. AA-656.
Recommended that the company shut off water 81′ above the point proposed.
Well No. 72, commence drilling. AA-657.
Recommended that the company shut off water 47′ above the point proposed.

SECTION 36.

Shell Company of California.
Well No. 1, deepen. AA-270.
Approved proposal to deepen about 35′.
Well No. 1, redrill. AA-448.
Approved proposal to remove a string of 4¾″ casing which was hanging in the well.
Well No. 2, shut-off. A-213.
Test of water shut-off approved.
Well No. 2, redrill. AA-464.
Approved proposal to plug bottom of well.
Well No. 2, plug bottom. AA-507.
Approved proposal to plug off bottom water.
Well No. 2, redrill. AA-547.
Approved proposal to do additional plugging in bottom.
Well No. 3, commence drilling. AA-411.
Proposed depth of water shut-off approved.
Well No. 3, shut-off. A-321.
Test of water shut-off satisfactory.
Well No. 3, plug casing. AA-647.
Approved proposal to plug in bottom to shut off water.

Standard Oil Co.

Well No. 1, shut-off. A-214.

Production test indicated that "top water" in this well had been successfully shut off.

Well No. 6, drill new well. AA-463.

Proposed depth of water shut-off approved.

Well No. 6, shut-off. A-356.

Test of water shut-off satisfactory.

T. 20 S., R. 14 E., M. D. B & M.

SECTION 1.

Zier Oil Co.

Well No. 3, redrill. AA-661.

Approved proposal to replace collapsed oil string.

Well No. 4, redrill and deepen. AA-598.

Approved proposal to redrill and deepen about 40′.

Well No. 10, redrill. AA-414.

Approved proposal to remove liner and carry oil string to original depth.

Well No. 12, redrill. AA-629.

Approved proposal to replace collapsed oil string.

Well No. 16, redrill and deepen. AA-376.

Approved proposal to pull oil string; cement 10″ at about 565′; deepen well with 8¼″, prospecting for lower oil sand.

Well No. 16, redrill and deepen. AA-456.

A proposal to recement at 614′, which is below an oil sand open in neighboring wells, was not approved. Recommended that company submit any evidence they may have that this sand carries water before approval to shut it off would be given.

Well No. 16, bridge hole for test of water shut-off. AA-466.

No evidence was submitted proving that top oil sand carried water, but the 8¼″ was cemented at 621′ and a test of water shut-off showed that water was entering the well. Approved proposal to put bridge under water string and again test.

Well No. 16, shut-off. A-284.

Test demonstrated that the 8¼″ cemented at 621′ prevented water from passing to lower levels of the well. There was no evidence to show that the upper oil sand which was shut off was protected from water.

Well No. 16, redrill. AA-550.

Bottom water was encountered and the well plugged before filing notice. The location of plug and manner of plugging was approved and the company's attention called to the violation of the law regarding filing of notices before the work.

Well No. 17, redrill and deepen. AA-453.

Approved proposal to redrill and deepen this well.

Well No. 18, deepen. AA-586.

Rejected proposal to deepen from 461′ to about 700′. Recommended drilling not deeper than 580′ to avoid bottom water.

Penn Coalinga Petroleum Co.

Well No. 10, shut-off. A-222.

Test of water shut-off was satisfactory. Proposal to perforate oil string and make production test was approved.

SECTION 12.

Associated Oil Co.

Shawmut New No. 1, begin drilling. AA-516.

The proposal to shut off the "tar sand," open in some neighboring wells and non-productive, by using 100 sacks of cement was approved. The depth of water shut-off for this purpose was estimated to be 24′ deeper than proposed.

Well No. 1, shut-off. A-320.

Test of water shut-off satisfactory.

Associated Oil Co.

Shawmut New No. 2, commence drilling. AA-581.

Proposed depth of water shut-off approved.

Well No. 2, shut-off. A-348.

Test of water shut-off satisfactory.

Shawmut No. 3 (new number), commence drilling. AA-608.

Proposed depth of water shut-off approved.

Shawmut No. 4 (new number), commence drilling. AA-609.

Recommended depth of water shut-off 32′ higher than proposed.

Shawmut New No. 5, commence drilling. AA-582.

Recommended depth of water shut-off 106′ higher than proposed, to be the same relatively as neighboring wells.

Shawmut No. 21, commence drilling. AA-565.

Proposed depth of water shut-off approved.

Well No. 21, shut-off. A-336.

Test of water shut-off satisfactory.

Shawmut No. 24 (new number), No. 2 (old number), deepen. AA-583.

Approved proposal to deepen.

Shawmut No. 27 (old No. 4), deepen. AA-584.

Approved proposal to deepen.

Shawmut No. 31 (new number), No. 7 (old number), deepen. AA-585.

Approved proposal to deepen.

Shawmut No. 34, deepen. AA-588.

Approved proposal to deepen.

Well No. 41 (old No. 6), deepen. AA-462.

Approved proposal to deepen.

Shawmut No. 41, redrill. AA-551.

Approved proposal to pull back oil string and fill up lower oil sand.

Well No. 42 (old No. 8), deepen. AA-422.

Approved proposal to deepen.

Shawmut No. 44 (old No. 1), redrill. AA-505.

Approved proposal to redrill and lower oil string.

Homestead Development Co.

Well No. B-3, redrill. AA-468.

Approved proposal to remove oil string as low as possible and produce from open hole.

Well No. B4, redrill. AA-577.

Approved proposal to remove oil string or do additional perforating.

Well No. B-8, redrill. AA-324.

Approved proposal to replace liner with new perforated pipe.

Well No. B-9, begin drilling. AA-501.

'Proposed depth of water shut-off approved with understanding that "tar sand" would be protected with sufficient cement, as agreed to by Associated Oil Co.

Well No. B-9, shut-off. A-332.

Test of water shut-off satisfactory.

Well No. B-10, commence drilling. AA-616.

Proposed depth of water shut-off approved.

Well No. C-1, redrill. AA-562.

Approved proposal to pull or move oil string.

Well No. C-3, redrill. AA-211.

Approved proposal to replace old liner.

Well No. C-4, redrill. AA-438.

Approved proposal to replace collapsed oil string or insert liner.

Well No. C-5, reperforate. AA-566.

Approved proposal to reperforate from about 777′ to 700′.

Coalinga Star Oil Co.

Well No. 1, redrill. AA-389.

Approved proposal to carry oil string to old bottom, sidetracking liner.

Coalinga Star Oil Co.

Well No. 2, redrill. AA-570.

Approved proposal to pull 4½″ casing and redrill with 6¼″ oil string to old bottom.

Well No. 2, redrill. AA-606.

Approved proposal to set packer in water string. Recommended that company file notices before commencing work.

Well No. 8, redrill. AA-571.

Approved proposal to cut out 4½″ casing and carry 6¼″ oil string to old bottom.

Well No. 9, deepen. AA-637.

Approved proposal to deepen.

Well No. 10, redrill. AA-572.

Approved proposal to remove liner and carry oil string to bottom.

Well No. 11, redrill. AA-374.

Approved proposal to replace collapsed oil string. Attention of the company was directed to the fact that necessary records pertaining to this property had not been filed with this department.

Well No. 11, redrill. AA-452.

Attention of the company was directed to the fact that water was present in the well after redrilling. Approved proposal to pull oil string and plug below water string in order to pump cement behind same.

Pilot Oil Co.

Well No. 5, redrill. AA-671.

Approved proposal to put in new oil string.

Well No. 7, commence drilling. AA-424.

Proposed depth of water shut-off approved, making formation shut-off.

Well No. 7, shut-off. A-283.

Test of water shut-off satisfactory.

Well No. 7, deepen. AA-506.

Formation shut-off failed. Approved proposal to cement same string 16′ deeper.

Well No. 7, shut-off. A-298.

Test of water shut-off satisfactory.

Spinks Crude Oil Co.

Well No. 1-E, redrill. AA-542.

Approved proposal to carry oil string to bottom, replacing liner.

Well No. 8, commence drilling. AA-622.

Proposed depth of water shut-off approved.

Seneca Oil Company.

Well No. 6, abandon. AA-610.

Approved proposal to abandon after certain plugging and testing. If the water present was found to be "bottom water" additional work would then be recommended.

Well No. 7, commence drilling. AA-309.

Proposed depth of water shut-off approved.

Well No. 7, shut-off. A-248.

Test of water shut-off satisfactory.

Ward Oil Co.

Well No. 3, redrill. AA-388.

Approved proposal to replace collapsed oil string.

Section 13.

Kern Trading & Oil Co.

Well No. 10, shut-off. A-236.

Production test showed that water had been shut off with packer.

Well No. 14, redrill. AA-408.

Approved proposal to set packer in water string.

Well No. 31, redrill. AA-225.

Approved proposal to replace oil string and land screen liner.

Union Oil Company of California.

Well No. 8, redrill. AA-312.

Approved proposal to set packer in water string.

Well No. 8, shut-off. A-231.

Production test showed an excessive amount of water. Recommended another test after 90 days.

Well No. 8, shut-off. A-267.

A production test indicated that water had been shut off with packer.

Well No. 9, redrill. AA-250.

Approved proposal to reset packer.

Well No. 9, redrill. AA-283.

Approved proposal to pull packer and test oil string for leak.

Well No. 9, shut-off. A-232.

A production test showed an excessive amount of water. Recommended another test after 90 days.

Well No. 9, shut-off. A-268.

Production test indicated water not shut off. Recommended pulling packer for examination and testing oil string.

Well No. 14, shut-off. A-233.

A production test showed excessive water. Recommended testing packer and oil string with dye.

Well No. 14, shut-off. A-269.

Production test showed practically no improvement. Again recommended testing packer and oil string with dye.

Well No. 16, redrill. AA-296.

Approved proposal to pull packer and repair leak in oil string.

Well No. 16, redrill. AA-355.

Approved proposal to pull packer and repair leak in oil string.

Well No. 16, shut-off. A-234.

Production test showed excessive water. Recommended further pumping.

Well No. 16, shut-off. A-270.

Production test showed improvement in water content. Recommended further pumping.

SECTION 23.

St. Paul Consolidated Oil Co.

Well No. 6, shut-off. A-182.

Test of water string satisfactory. Recommended drilling to about 700′ and testing before further deepening.

SECTION 24.

Inca Oil Co.

Well No. 7, redrill. AA-311.

Approved proposal to continue redrilling.

Well No. 33, shut-off. A-210.

Test of water string satisfactory.

Well No. 33, shut-off. A-215.

Test showed well not making top water. Recommended plugging in bottom.

Salvia Oil Co.

Well No. 2, report on work done. AA-239.

The water string was accidentally shot off, letting water into well. Well was bridged in water string below point of shooting. Bridge consisted of brick, adobe, and iron slivers, which may not have excluded water from oil sands. Recommended that well be cleaned out to top of the bridge and plugged with cement for at least 10′.

Well No. 6, shut-off. A-225.

Production test showed excessive water. Recommended further pumping.

Salvia Oil Co.

Well No. 9, shut-off. A-166.

Production test showed all water. Recommended further pumping.

Well No. 9, shut-off. A-226.

Production test showed slight improvement. Recommended further pumping.

Well No. 9, discontinue pumping. AA-444.

Approved proposal to discontinue pumping due to condition of Claremont wells Nos. 1 and 2. Recommended fluid level test.

Well No. 9, shut-off. A-286.

Test showed fluid had gone down 62′ in 30 days. Recommended further pumping.

Well No. 13, shut-off. A-227.

Well was not kept pumping, as previously recommended. A fluid level test was recommended.

Well No. 14, shut-off. A-228.

Production test showed excessive water. Recommended further pumping.

Well No. 14, shut-off. A-282.

Test to determine depth to top of fluid. Recommended further pumping.

Premier Oil Co.

Well No. 1, redrill. AA-528.

Approved proposal to proceed with redrilling, as previously recommended. This work was held up on account of tests being made on neighboring wells.

Well No. 1, shut-off. A-335.

Test of water shut-off satisfactory.

Traders Oil Co.

Well No. 3, redrill. AA-574.

Approved proposal to set packer in water string.

Well No. 3, shut-off. A-341.

Production test indicated that packer shut out water.

Well No. 16, commence drilling. AA-498.

Proposed depth of water shut-off approved.

Well No. 16, shut-off. A-301.

Test of water shut-off approved.

Well No. 17, drill new well. AA-458.

Proposed depth of water shut-off approved.

Well No. 17, shut-off. A-271.

Test of water shut-off satisfactory.

Well No. 18, shut-off. A-250.

Test of water shut-off satisfactory.

Well No. 19, commence drilling. AA-369.

Proposed depth of water shut-off approved.

Well No. 19, shut-off. A-245.

Test of water shut-off satisfactory.

Well No. 25, redrill. AA-281.

Notice stated that packer had been set and work was completed. Recommended that department be notified for test of water shut-off.

Well No. 25 shut-off. A-223

Production test showed excessive water. Recommended further pumping.

Well No. 29, redrill. AA-245.

Approved proposal to put in new oil string.

Well No. 37, commence drilling. AA-596.

Approved proposed depth of water shut-off.

Well No. 37, shut-off. A-342.

Test of water shut-off satisfactory.

Well No. 38, commence drilling. AA-523.

Approved proposed depth of water shut-off.

Well No. 38, shut-off. A-325.

Test of water shut-off satisfactory.

Traders Oil Co.

Well No. 41, commence drilling. AA-418.

Proposed depth of water shut-off approved. Recommended that cement be used in making this shut-off. After considerable correspondence and discussion, in which this department advocated the use of cement in shutting off water at this well, approval was finally given to make a formation shut-off.

Well No. 41, shut-off. A-278.

Test of water shut-off satisfactory. Well was reported to have stood 16 hours. 2½′ of fluid was found at the time of test.

Well No. 41, redrill. AA-494.

Eight days after test, the company reported that a casing leak developed, and approval was given to try another formation shut-off with the same casing. However, cement was again advised.

Well No. 41, deepen. AA-513.

Approved proposal to cement 8¼″ below the 10″, leaving the 10″ undisturbed.

Well No. 41, shut-off. A-349.

Test of 8¼″, which was cemented, showed that water was completely shut off.

Claremont Oil Co.

Well No. 1, shut-off. A-165.

Packer in water string. Production test showed all water. Recommended further pumping.

Well No. 1, shut-off. A-229.

Production test showed no improvement. Recommended fluid-level test after 30 days.

Well No. 1, shut-off. A-258.

Fluid-level test indicated well probably making its own water. Recommended examination of packer and that company repair well.

Well No. 2, redrill. AA-217.

Approved proposal to set packer in water string.

Well No. 2, shut-off. A-230.

Production test showed all water. Recommended fluid-level test.

Well No. 2, shut-off. A-257.

Fluid-level test indicated that well probably was making its own water. Recommended examination of packer and that company repair well.

Well No. 4, redrill. AA-218.

Approved proposal to test effectiveness of bridge over oil sands by setting packer in water string and bailing out water.

Well No. 4, shut-off. A-193.

Test of bridge above oil sands satisfactory.

Well No. 7, commence drilling. AA-546.

Proposed depth of water shut-off approved.

Well No. 7, shut-off. A-344.

Test of water shut-off approved as satisfactory.

Well No. 8, commence drilling. AA-455.

Recommended point of water shut-off 25′ higher than proposed.

Well No. 8, shut-off. A-315.

Test of water shut-off satisfactory.

Well No. 8, alter casing. AA-658.

Approved proposal to shut off water by setting packer in water string. It was called to the company's attention that the well was drilled through the "green shale" and may have bottom water.

Well No. 8, plug bottom of. AA-662.

Approved proposal to plug bottom to shut off water.

Well No. 11, redrill. AA-578.

Approved proposal to set packer in water string.

Well No. 20, commence drilling. AA-644.

Proposed depth of water shut-off approved.

SECTION 25.

Kern Trading & Oil Co.

Well No. 9, abandon. AA-489.

Approved proposal to abandon, specifying depths of shooting and plugging.

Well No. 10, abandon. AA-490.

Approved proposal to abandon, specifying depths of shooting and plugging.

Well No. 11, abandon. AA-488.

Approved proposal to abandon, specifying depths of shooting and plugging.

Well No. 22, redrill. AA-409.

Approved proposal to set packer in water string.

Well No. 35, fluid level. A-305.

Test to determine depth to top of fluid.

Well No. 35, redrill. AA-568.

It appearing to the State Supervisor that water had broken into this well and was probably coming through the water string and was damaging the producing oil sand, as shown by the production of a neighboring well, a formal order was issued to the company to repair the well by one of three specified methods. The company's proposal to set packer in the water string was approved.

Well No. 37, fluid level. A-308.

Test to determine depth to top of fluid.

Well No. 39, fluid level. A-295.

Test to determine depth to top of fluid.

Well No. 54, shut-off. A-357.

A production test showed excessive water. Further pumping was recommended.

SECTION 26.

Coalinga Homestake Oil Co.

Well No. 2-A, commence drilling. AA-273.

The company's proposal to shut off above and below the usual producing sands and prospect for a deeper sand was approved. The proposed depths of shut-off were approved.

Well No. 2-A, shut-off. A-251.

Test of water string showed no water below the shoe. This was cemented 80′ lower than proposed and approved, and formations open in neighboring wells were shut off.

Well No. 2-A, cement at about 754′. AA-420.

Approved proposal to cement below oil sands and above water at 754′. Recommended that if productive sand was not found deeper, that tests be made to show that upper sands are protected from water.

Well No. 2-A, shut-off. A-254.

Test to determine location of bottom water before cementing above it. Test satisfactory.

Well No. 2-A, shut-off. A-300.

Test showed some water entering well with 8¼″ cemented at 1625′, source undetermined. Later tests showed water was from a sand below 1635′. Recommended company file information previously requested.

Ozark Oil Co.

Well No. 2, redrill. AA-500.

Approved proposal to replace collapsed oil string.

Well No. 5, redrill. AA-282.

Approved proposal to remove oil string, bridge, and test for both top and bottom water.

Well No. 5, redrill. AA-404.

Approved proposal to bridge and test water string.

Well No. 6, redrill. AA-465.

Approved proposal to pull oil string and test for top and bottom water.

Ozark Oil Co.

Well No. 6, shut-off. A-281.

Test indicated that bottom water was shut off.

Well No. 6, abandon. AA-504.

Approved proposal to abandon.

Augustine and Butz.

Well No. 5, alter casing. AA-660.

Approved proposal to set packer in water string.

Well No. 6, redrill. AA-601.

Approved proposal to bridge and test water string.

Netherlands Oil Co.

Well No. 3, shut-off. A-239.

A production test showed excessive water. Recommended further pumping and that company file logs and other data in order to determine the probable source of this water.

SECTION 36.

Associated Oil Co.

Well No. 8-D, shut-off. A-358.

A production test indicated that water is shut off.

Well No. 9-D, shut-off. A-220.

A production test showed considerable improvement in water content.

Well No. 9-D, shut-off. A-303.

A production test indicated water is shut off.

T. 20 S., R. 15 E., M. D. B & M.

SECTION 1.

Kern Trading & Oil Co.

Well No. 3, commence drilling. AA-290.

Proposed depth of water shut-off approved after receipt of revised notice.

Well No. 3, shut-off. A-218.

Test of water shut-off satisfactory.

Well No. 4, commence drilling. AA-427.

Proposed depth of water shut-off approved.

Well No. 5, commence drilling. AA-289.

Proposed depth of water shut-off approved, after receipt of revised notice.

Well No. 5, shut-off. A-240.

Test of water shut-off approved.

Well No. 16, commence drilling. AA-533.

Recommended company report depth of red rock in order to check proposed depth of water shut-off.

Well No. 46, shut-off. A-163.

A small amount of water came into well while standing for test, which was probably returned drilling water. Well was passed for further drilling and recommended that a production test be made after completion.

Well No. 47, recement. AA-349.

A water sand was encountered under the first water string and proposal to cement deeper was approved.

Well No. 47, redrill. AA-446.

8¼″ casing, which was cemented at a depth of 3867′, failed to shut off water. Approved proposal to recement 8¼″ casing at a depth of 3870′.

Well No. 47, shut-off. A-309.

Test of water shut-off satisfactory.

Well No. 47, redrill. AA-628.

Approved proposal to mud up under pressure and cement under pressure below first oil sand on account of unsuitability of formation and condition of hole above.

Well No. 138, commence drilling. AA-428.

Proposed depth of water shut-off approved.

SECTION 2.

Shell Oil Company of California.

Well No. 3, perforate $6\frac{5}{8}''$ casing. AA-386.

Proposal to do additional perforating of the oil string approved.

Well No. 3, redrill. AA-540.

Approved proposal to remove upper portion of oil string.

Well No. 10, shut-off. A-221.

Production test indicated that "bottom water" had been successfully shut off. Test approved.

Well No. 19, test for water. AA-328.

Attention of the company was directed to the fact that proposal to rip $4\frac{1}{2}''$ casing and plug at a certain depth was filed after such work had been done. Recommended that the company make further tests at the well and before doing additional work.

Well No. 19, shut-off. A-217.

Test indicated that water from below a depth of 3312′ had been prevented from passing into formations above this point and that $6\frac{1}{4}''$ casing shut off "top water."

Well No. 19, abandon. AA-360.

Proposal to abandon was approved. It was recommended that $8\frac{1}{4}''$ casing be left in place as a conductor in case it was necessary to do additional work in the future.

Well No. 25, redrill. AA-259.

Approved proposal to redrill well in order to increase production and relieve sand trouble.

Well No. 28, deepen. AA-326.

Approved proposal to deepen.

Well No. 31, shut-off. A-158.

Test of water shut-off satisfactory.

Well No. 32, shut-off. A-211.

Test of water shut-off satisfactory.

Well No. 32, perforate. AA-614.

Approved proposal to do additional perforating of oil string.

Well No. 33, commence drilling. AA-246.

Approved proposed depth for shutting off the water.

Well No. 33, shut-off. A-263.

Test of water shut-off satisfactory.

Well No. 33, redrill. AA-626.

Approved proposal to put in liner.

Well No. 34, commence drilling. AA-247.

Approved proposed depth for water shut-off.

Well No. 34, shut-off. A-259.

Test of water shut-off satisfactory.

Well No. 35, commence drilling. AA-366.

Proposed depth of water shut-off approved.

Well No. 35, shut-off. A-297.

Test of water shut-off satisfactory.

Well No. 36, commence drilling. AA-367.

Approved proposed depth for water shut-off.

Well No. 36, shut-off. A-327.

Test of water shut-off satisfactory.

Well No. 37, commence drilling. AA-410.

Proposed depth of water shut-off approved.

Well No. 38, commence drilling. AA-526.

Proposed depth of water shut-off approved.

SECTION 3.

Kern Trading & Oil Co.

Well No. 26, commence drilling. AA-382.

Company proposed to shut water off at 3150′. This department estimated the top of oil sand to be 3189′ and recommended that water be shut off at some point above this depth.

Well No. 26, shut-off. A-275.

Test of water shut-off satisfactory.

SECTION 4.

Coalinga-Monterey Oil Co.

Well No. 1, abandon. AA-396.

Approved proposal to remove all casing available. Oil-bearing formations were not encountered in this well. No plugging was required.

Union Oil Company of California.

Well No. 4, La Vista, abandon. AA-381.

Proposal to abandon was rejected and recommendation made that certain sands be protected by plugging before available casing was pulled.

Well No. 4, abandon. AA-621.

Approved proposal to remove upper portion of 8¼″ and 10″ casings with the understanding that well would be left in such shape that plugging could be done in the future, if found necessary.

SECTION 6.

General Petroleum Corporation.

Well No. 1, shut-off. A-149.

Test showed that water was not shut off. Approved proposal from company to shut off water at a lower depth.

Well No. 1, shut-off. A-243.

Test of water shut-off approved.

Well No. 1, redrill. AA-399.

Proposal to deepen well was approved.

Well No. 1, redrill. AA-499.

The proposal to remove oil string and do additional perforating was approved.

Well No. 4, redrill. AA-557.

Approved proposal to move oil string and do additional perforating.

Well No. 8, redrill. AA-405.

Proposal to test the 8¼″ water string and redrill was approved.

Well No. 8, redrill. AA-569.

Approved proposal to put in new oil string.

Well No. 12, redrill. AA-400.

Approved proposal to redrill well in order to obtain production from the "light oil sand" and if this result was not satisfactory, to redrill to original depth in order to produce from the "heavy sand."

Well No. 12, abandon. AA-522.

Approved proposal to abandon.

Well No. 22, redrill. AA-320.

Approved proposal to raise screen pipe in order to produce from open hole.

Well No. 27, redrill. AA-539.

Approved proposal to put in new oil string.

Well No. 34, shut-off. A-197.

Test of water shut-off satisfactory.

Well No. 35, shut-off. A-176.

Test of water shut-off satisfactory.

Well No. 36, redrill. AA-303.

Approved proposal to perforate oil string in order to produce from "light oil sand."

Well No. 37, deepen. AA-236.

Approved proposal to deepen.

General Petroleum Corporation.

Well No. 37, redrill. AA-319.

Approved proposal to put bridge in bottom of well and heaving plug in 8¼″ casing in order to shut off heavy oil and water which possibly came from the bottom.

Well No. 37, test for water. AA-351.

Approved proposal to remove oil string and bridge below water string in order to test same.

Well 37, redrill. AA-361.

The company proposed to shut off water by tamping around 6¼″ down to 1340′ with the 8¼″ casing. It was recommended that the company try the tamping process in an endeavor to shut water off in this well.

Well No. 37, shut-off. A-260.

This test demonstrated that formations between depths of 1286′ and 1330′ were protected from water. There is no evidence at this time to show that the oil-bearing formations between 1152′ and 1286′ are protected from water.

American Petroleum Company.

Well No. 13, deepen. AA-222.

Proposal was to deepen, mud up, and cement off a sand which was expected to be encountered. This sand contained "edge-water" in the vicinity of this well. Recommended that the company enter this sand and determine its contents. In case water was found in it, that they cement a string of casing in the shale above the water sand, in order to protect the upper oil sands before deepening.

Well No. 14, deepen. AA-221.

The proposal was to deepen, mud up, and cement off a sand which carried "edge-water" in an adjoining well. Recommended that the company test the "edge sand" in order to determine its contents, and, in case water was found, that they cement a string of casing in the shale above the water sand in order to protect the upper oil sands. In case the "edge sand" was found to contain oil at this well, the proposed method by the company would be satisfactory, as long as they could prove that the upper oil sands were fully protected.

Well No. 15, deepen. AA-223.

The proposal was to deepen, mud up, and cement off a sand which carried "edge-water" in an adjoining well. Recommended that the company test the "edge sand" in order to determine its contents, and, in case water was found, that they cement a string of casing in the shale above the water sand in order to protect the upper oil sands. In case the "edge sand" was found to contain oil at this well, the proposed method by the company would be satisfactory, as long as they could prove that the upper oil sands were fully protected.

Well No. 15, shut-off. A-180.

A test was made, demonstrating that the "edge sand" at this well carried oil. Approved proposal to cement a string of casing below this sand.

Well No. 15, shut-off. A-212.

8¼″ casing was cemented below the "edge sand." Test approved as satisfactory.

Well No. 37, redrill. AA-521.

Approved proposal to put in new oil string.

Well No. 44, redrill. AA-545.

Approved proposal to recement water string after shooting.

Mercantile Crude Oil Co.

Well No. 3, deepen. AA-331.

Approved proposal to deepen through oil sand which had formerly been encountered at a depth of 1065′.

Well No. 5, redrill. AA-353.

Approved proposal to shut off water above the "light sand."

Well No. 5, shut off. A-273.

The test failed to show conclusively that the water string had completely excluded the water from the well. Recommended that the company pump well for sixty days and furnish this department with a report showing the amount of water and oil produced each ten-day period during this time.

S. W. & B. Oil Co.

Well No. 1, redrill. AA-495.

Approved proposal to cut off 4½" oil string and redrill the well.

Well No. 6, redrill. AA-467.

Approved proposal to remove a liner and put in a new oil string.

New San Francisco Crude Oil Co.

Well No. 10, redrill. AA-354.

Approved proposal to pull out 6¼" oil string and replace it with shop-perforated casing.

York Coalinga Oil Co.

Well No. 6, redrill. AA-619.

Approved proposal to replace oil string.

SECTION 7.

Kern Trading & Oil Co.

Well No. 11, abandon. AA-385.

The company proposed to clean out the well to the top of a plug which had formerly been placed in the well. In case it was found that the cement had not set properly, it was proposed to redrill the well and remove as much of the 6⅝" casing as possible, leaving the well cased to the top of the oil sand with 8¼" casing. This proposal was approved.

Well No. 11, continue abandonment. AA-402.

A test witnessed by a member of this department showed that the cement plug formerly placed in this well had set properly. Approved proposal to remove 6⅝" casing.

Well No. 27, abandon. AA-445.

Approved proposal to abandon, specifying depths of shooting and plugging.

Well No. 27, abandon. AA-534.

Information for Report AA-445 was incomplete. Changes were made in depths of shooting and plugging, based on the additional information.

Arica Oil Co.

Well No. 8, redrill. AA-375.

Approved proposal to remove liner and redrill the well to original depth, in case the oil string was damaged while doing this.

Well No. 22, commence drilling. AA-554.

Proposed depth of water shut-off approved.

Well No. 22, shut-off. A-353.

Test of water shut-off satisfactory.

Well No. 43, shut-off. A-339.

10" casing was cemented 30' higher than was proposed and approved, and water was encountered below. Recommended company file proposal to shut off same.

Well No. 43, commence drilling. AA-518.

Proposed depth of water shut-off approved.

Well No. 43, cement deeper. AA-618.

Approved proposal to cement 20' deeper with 8¼".

Section Seven Oil Co.

Well No. 2, redrill. AA-417.

Approved proposal to carry oil string to depth at which well was originally drilled.

Well No. 3, redrill. AA-439.

The company proposed to remove the oil string, bridge the well, and shut off water and then redrill the well. Recommended that the company furnish a history of this well before commencing work of redrilling, in order that further study might be made of the proposal submitted by the company.

Well No. 3, redrill. AA-520.

Upon receipt of history the proposed redrilling was approved.

SECTION 8.

Coalinga National Petroleum Co.

Well No. 1, abandon. AA-624.

Approved abandonment as proposed. Requested notice for test of plug below bottom of 8¼". This plug was not tested by this department.

Well No. 2, commence drilling. AA-240.

Estimated depth of water shut-off approved.

Well No. 2, shut-off. A-256.

The test showed that water was not completely shut off with 10" casing. Recommended that the company make further tests in order to determine possible source of water entering the well.

Well No. 2, shut-off. A-266.

Test showed that water was shut-off with 8¼" casing, which was landed in the formation below the point at which 10" casing was cemented.

M. K. & T. Co.

Well No. 2, abandon. AA-563.

The company was found to be pulling casing from this well without notice or approval and without plugging to protect oil sands. After receiving report of work done, approval to abandon was given, specifying depths of shooting and plugging.

Well No. 2, abandon. AA-590.

The 4½" casing was found to be landed at a point other than reported. Approval was given to plug without shooting at this point.

Coalinga Eight Oil Co.

Well No. 2, redrill. AA-276.

Oil string and water string had collapsed above the point of shut-off. Approved proposal to plug lower portion of old hole with cement; cut off the 6¼" and 8¼" casing above the point of collapse; and recement 8¼" casing at about the same depth as originally cemented.

SECTION 11.

Kern Trading & Oil Co.

Well No. 31, shut-off. A-164.

On account of water content in production, recommended that the company pump the well for 30 days, at which time another production test would be witnessed and further recommendations made.

Well No. 31, shut-off. A-237.

Test showed that water from below a depth of 3860' had been excluded from formations above this depth. Fluid produced by the well contained 1% water.

SECTION 12.

Coalinga Mohawk Oil Co.

Well No. 2, pull casing. AA-412.

Rejected proposal to pull casing, as no provision was made to protect oil-bearing formations which had been encountered in this well.

Well No. 3, redrill. AA-561.

Approved proposal to redrill and cement 6¼" casing after shooting to break up sidetracked casing.

Well No. 4, plug the bottom. AA-330.

Recommended that the company rip and shoot the lower portion of 6¼" casing and plug with cement in the formation between depths at which the well was shot; demonstrate that cement set properly before perforating upper oil sands formerly shut off.

Well No. 4, plug bottom of well. AA-472.

Proposal to plug above intermediate water approved. The necessity of plugging at a lower depth in case damage resulted was pointed out.

Well No. 4, abandon. AA-544.

Approved proposal to abandon after certain shooting and plugging.

Coalinga Mohawk Cil Co.
Well No. 5, redrill. AA-441.
Approved proposal to redrill well with 6¼″ casing to a depth of about 4100′.
Well No. 5, deepen. AA-441 Supp.
Approved supplementary proposal to redrill to about 4170′.
Well No. 5, abandon. AA-503.
Approved proposal to abandon.
Well No. 7, plug off bottom of well. AA-277.
Proposal to plug off bottom water approved.
Well No. 7, shut-off. A-238.
The results of a production test showed that the fluid produced contained 3% water and that "bottom water" had been shut off.
Well No. 8, shut-off. A-279.
Test of water shut-off satisfactory.
Well No. 9, commence drilling. AA-477.
Proposed depth of water shut-off approved.
Well No. 10, commence drilling. AA-538.
Proposed depth of water shut-off approved.
Well No. 11, commence drilling. AA-625.
Proposed depth of water shut-off approved.

Section 16.

T. H. Pike.
Well No. 1, abandon. AA-212.
Approved proposal to abandon this well, indicating depths at which shooting and plugging should be done.

Section 17.

Oil Exploration Co.
Well No. 3, commence drilling. AA-359.
Recommended that water be shut off 20′ deeper than proposed.
Well No. 3, shut-off. A-255.
Test of water shut-off satisfactory.

Section 18.

Lakeport Petroleum Co.
Well No. 1, redrill. AA-322.
Approved proposal to replace collapsed oil string.
Well No. 16, cement at about 2487′. AA-416.
Proposed depth of water shut-off approved.
Well No. 16, shut-off. A-265.
Approved test of water shut-off, stating that 5½ hours was not sufficient time to allow the well to stand for test and that in the future wells would be required to stand at least 12 hours.
Well No. 16, redrill. AA-636.
Approved proposal to put in new oil string.
Well No. 24, commence drilling. AA-431.
Proposed depth of water shut-off approved.

Nevada Petroleum Co.
Well No. 5C, abandon. AA-580.
Approved proposal to abandon. Recommended that plug under water string be tested by this department by filling hole to surface with water and allowing to stand 12 hours.
Well No. 5A, redrill. AA-549.
Approved proposal to redrill and shut-off water with 8¼″.
Well No. 5A, redrill. AA-604.
Approved proposal to recement 8¼″.

American Petroleum Co.
Well No. 4, set packer. AA-210.
Approved proposal to set packer on oil string to shut out top water.

American Petroleum Co.

Well No. 7, redrill. AA-379.

Approved proposal to replace collapsed oil string.

Well No. 7, redrill. AA-433.

Approved proposal to replace collapsed oil string.

Well No. 9, redrill and deepen. AA-327.

Approved proposal to cement below upper "edge-water" sand.

Well No. 29, redrill. AA-390.

Approved proposal to replace collapsed oil string.

SECTION 19.

Kern Trading & Oil Co.

Well No. 1, abandon. AA-484.

Approved proposal to abandon, indicating depths at which shooting and plugging should be done.

Well No. 3, shut-off. A-235.

A production test showed an improved condition of the well after setting packer. Recommended further pumping test.

Well No. 3, shut-off. A-360.

A production test indicated that top water was shut off.

Well No. 22, abandon. AA-485.

Approved proposal to abandon well, indicating depths at which shooting and plugging should be done.

Well No. 22, shut-off. A-331.

Test of "bottom-water" shut-off approved.

Well No. 30, remove 8" and place adapter. AA-391.

Approved proposal to remove 8¼" oil string and set adapter from 10" to 6⅝" liner.

Well No. 38, redrill. AA-426.

Approved proposal to test water string and redrill to original depth.

Well No. 38, shut-off. A-302.

Test of water shut-off satisfactory. Shoe of water string located with latch jack.

American Petroleum Co.

Well No. 1, fluid level. A-317.

Test to determine depth to top of fluid.

Well No. 5, fluid level. A-316.

Test to determine depth to top of fluid.

Well No. 6, fluid level. A-314.

Test to determine depth to top of fluid.

Well No. 6, redrill. AA-579.

Approved proposal to put in new oil string.

Well No. 8, redrill. AA-560.

Approved proposal to pull oil string and test for source of water.

Well No. 8, redrill. AA-611.

Approved proposal to recement 8¼" if top water is found.

Well No. 8, abandon. AA-643.

Proposal to abandon approved. The hole was in such shape that it did not seem advisable to plug in the ordinary way to shut off water. It was recommended that the hole be cleaned out to bottom, the oil sands mudded up and the hole kept full of mud fluid, and that the 10" casing be left undisturbed.

Well No. 11, redrill. AA-275.

Approved proposal to test water string and set packer or make another shut-off, if found necessary.

Well No. 13, redrill. AA-380.

Approved proposal to replace oil string. Recommended that packer be set in case well was making its own water.

Well No. 15, redrill. AA-602.

Approved proposal to put in new oil string.

Well No. 17, redrill. AA-280.

Approved proposal to replace collapsed oil string.

Oil Exploration Co.

Well No. 4, commence drilling. AA-251.

Recommended that company shut water off about 2440′ instead of 2510′ as proposed.

Well No. 4, cement at about 2475′. AA-252.

After a conference of the company and neighboring operators, a proposal to cement at 2475′ was approved.

Well No. 4, as per letter attached. AA-387.

10″ casing cemented at 2475′ failed to shut off water. Approved proposal to drill ahead, prospecting for a suitable place to make another shut-off.

Well No. 4, shut-off. A-246.

Test of water shut-off satisfactory.

SECTION 20.

Nevada Petroleum Co.

Well No. 1, shut-off. A-185.

A production test showed a high percentage of water. A further pumping test was recommended.

Well No. 1, shut-off. A-224.

After increasing the fluid production, a test was made and further tests recommended.

Well No. 1, test for point of entrance of water. AA-659.

Approved proposal to test for point of entrance of water by introducing muddy water into the well and noting the point of entrance of clear water.

SECTION 30.

Creme Petroleum Co.

Well No. 1, correspondence.

See Creme complaint.

American Petroleum Co.

Well No. 1, N30, shut-off. A-252.

A production test showed the well to be making an excessive amount of water. Its source was undetermined.

Well No. 1, N30, redrill. AA-425.

Approved proposal to redrill to original depth and make further production test, and suggested that water string be tested before doing this work.

Well No. 1, N30, fluid level. A-289.

Test to determine depth to top of fluid.

Well No. 3, N30, fluid level. A-299.

Test to determine depth to top of fluid.

Well No. 5, N30, redrill. AA-432.

Approved proposal to replace collapsed oil string and redrill to original depth.

Well No. 5, N30, redrill. AA-541.

Approved proposal to recement water string.

Well No. 6, N30, fluid level. A-318.

Test to determine depth to top of fluid.

Well No. 7, N30, fluid level. A-294.

Test to determine depth to top of fluid.

Well No. 8, N30, fluid level. A-288.

Test to determine depth to top of fluid.

Well No. 9, N30, fluid level. A-285.

Test to determine depth to top of fluid.

Well No. 10, N30, fluid level. A-312.

Test to determine depth to top of fluid.

Well No. 11, N30, fluid level. A-313.

Test to determine depth to top of fluid.

American Petroleum Co.

Well No. 6, redrill. AA-321.

Approved proposal to recement water string.

Well No. 9, redrill. AA-649.

Approved proposal to recement water string.

Well No. 18, fluid level. A-287.

Test to determine depth to top of fluid.

Well No. 19, redrill. AA-437.

Approved proposal to pull packer and set new packer, if deemed advisable.

Well No. 24, fluid level. A-290.

Test to determine depth to top of fluid.

Nevada Petroleum Co.

Well No. 6, redrill. AA-334.

Approved proposal to test for source of water by bridging over oil sand and setting packer in shoe joint of water string.

Well No. 6, reset packer. AA-373.

Approved proposal to reset packer at a lower depth.

Well No. 6, fluid level. A-304.

Test to determine depth to top of fluid.

Well No. 7, redrill. AA-492.

Approved proposal to attempt to force cement back of water string to shut off top water.

Well No. 7, shut-off. A-293.

Well tested with hole open below shoe of water string into pocket of cement. After drilling ahead to cement bridge water came in, probably around cement bridge.

Well No. 4-A, redrill. AA-333.

Approved proposal to remove oil string and test water string.

Well No. 5-A, redrill. AA-332.

Approved proposal to remove oil string and test water string.

Well No. 5-A, shut-off. A-277.

Result of production test indicated that water was not completely shut off with hemp packer. Recommended further production test.

Well No. 7-A, shut-off. A-276.

Test of water shut-off satisfactory.

Well No. 8-A, redrill. AA-595.

Approved proposal to remove oil string, bridge, and test water string.

T. 20 S., R. 16 E., M. D. B. & M.

SECTION 18.

Southeastern Ltd. Oil Co.

Well No. 1, redrill. AA-370.

The work of pulling casing from this well was in progress when the attention of the company was called to the fact that no notice concerning this work had been filed. After receiving log and report of work done and notice covering further necessary work at the well, approval was given to continue removing casing after certain plugging had been done.

Well No. 1, discontinue redrilling. AA-393.

After doing a portion of the work recommended, the company stated that further progress below 3465′ could not be made. Approval was given to discontinue work at this depth.

T. 21 S., R. 14 E., M. D. B. & M.

SECTION 12.

Fifty-seven Oil Co.

Well No. 1, abandon well. AA-514.

Approved proposal to remove surface equipment only.

SECTION 13.

Ben Williams.

Well No. 1, S. N. Root, abandon. AA-670.

Approved proposal to abandon, specifying depths of shooting and plugging.

T. 21 S., R. 15 E., M. D. B. & M.

SECTION 6.

California Oil & Gas Co.

Well No. 4, redrill. AA-666.

Approved proposal to replace collapsed oil string.

Well No. 7-A, commence drilling. AA-249.

Recommended depth of water shut-off 50′ deeper than proposed.

Well No. 7-A, shut-off. A-199.

Test of water shut-off satisfactory. Casing cemented at proposed depth.

Well No. 7-A, recement. AA-377.

Approved proposal to cement 8¼″ 100′ below 10″.

Well No. 7-A, shut-off. A-242.

Test of water shut-off satisfactory.

Well No. 7-A, redrill. AA-603.

Approved proposal to loosen oil string in effort to increase production and, if possible, locate source of water.

Lucile Oil Co.

Well No. 2, redrill. AA-260.

Approved proposal to redrill and test for source of water.

Marion Oil Co.

Well No. 1, redrilling. AA-617.

Proposal to redrill well and plug in bottom approved, specifying that plugging be done by stages and tested.

SECTION 8.

Associated Oil Co.

Well No. 5-II, commence drilling. AA-423.

Proposed depth of water shut-off approved.

Well No. 5-II, shut-off. A-296.

Test of water shut-off satisfactory.

SECTION 18.

Boychester Oil Co.

Well No. 1, perforate casing. AA-675.

Approved proposal to perforate oil string and remove upper portion of same. Recommended that in future notice be filed before commencing work.

R. L. Patterson (formerly property of Coalinga Gem Oil Co.)

Well No. 1, abandon. AA-457.

Approved proposal to abandon.

SECTION 22.

Bunting Iron Works.

Well No. 1, Coalinga Hub Oil Co., abandon. AA-537.

Approved proposal to abandon, specifying depths of shooting and plugging.

CHAPTER VI.

DIRECTORY OF OIL OPERATORS.

Showing Number of Producing Wells on December 31, 1916, Location of Properties, and Also Date of Incorporation and Capital Stock of Such as Are Incorporated.

(Star preceding name indicates that operator was a producer during the year 1916.)

*A. & J. OIL COMPANY,
400 H. W. Hellman Bldg., Los Angeles, Cal. A. J. Jergins, President. H. J. Haase, Secretary. April 25, 1914, $80,000. Three wells, Kern County.

ÆTNA OIL, MINING AND DEVELOPING COMPANY.
256-8 Wilcox Bldg., Los Angeles, Cal. Wm. H. Smith, President. Dwight B. Harris, Secretary. May 14, 1913. $25,000.

ÆTNA PETROLEUM COMPANY,
350 California St., San Francisco, Cal. John Lawson, President. George S. Tyler, Secretary. April 20, 1899. $500,000 Orig. $500,000 Inc.

ALADDIN OIL COMPANY,
409 Consolidated Realty Bldg., Los Angeles, Cal. Wm. Mead, President. L. Schenck, Secretary. September 17, 1900. $250,000. Kern County.

*ALASKA PIONEER OIL COMPANY,
435 Mills Bldg., San Francisco, Cal. Wm. Chappell, President. W. J. Clark, Secretary. March 18, 1910. $500,000. Six wells, Kern County.

ALBERTA MIDWAY OIL COMPANY,
1003 Higgins Bldg., Los Angeles, Cal. F. Chappellet, President. C. R. Stevens, Secretary. (Dissolved.)

ALLIANCE OIL COMPANY,
254 Pine St., San Francisco, Cal. L. A. Phillips, President. H. P. Coles, Secretary. July 22, 1909. $3,000,000.

*ALMA OIL COMPANY,
517 Pacific Bldg., Oakland, Cal. C. E. Thomas, President. M. A. Thomas, Secretary. June 22, 1900. $400,000. Eighteen wells, Kern County.

ALMO OIL COMPANY,
Lemoore, Cal. J. McAdam, Jr., President. L. L. Follett, Secretary. June 23, 1904. $50,000.

ALTOONA MIDWAY OIL COMPANY,
Room 72 Altoona Trust Bldg., Altoona, Pa. R. W. A. Jamison, President. J. H. Fiske, Secretary. February 20, 1909. $500,000. Kern County.

ALVARADO OIL COMPANY,
1114 Union Oil Bldg., Los Angeles, Cal. L. H. Mitchell, President. V. C. McCollogh, Secretary. February 23, 1904. $300,000.

*AMALGAMATED OIL COMPANY,
55 New Montgomery St., San Francisco, Cal. Wm. Sproule, President. P. G. Williams, Secretary. October 27, 1904. $5,000,000. Twenty-five wells, Orange County; six wells, Los Angeles County.

*AMAUROT OIL COMPANY,
507 Foxcroft Bldg., San Francisco, Cal. William E. Miles, President. A. J. Weston, Secretary. Six wells, Kern County. (Dissolved; property operated by William E. Miles.)

AMAZON OIL COMPANY,
409 Citizens Savings Bank Bldg., Los Angeles, Cal. A. K. Nash, President. R. H. Pinney, Secretary. September 26, 1900. $400,000. Kern County.

AMBER OIL COMPANY,
803 Baker St., East Bakersfield, Cal. John Kincaid, President. S. K. Dickinson, Secretary. July 19, 1909. $500,000. Kern County.

AMERICAN CRUDE OIL COMPANY,
Room 1115, 456 S. Spring St., Los Angeles, Cal. January 3, 1912. $500,000. Kern County.

*AMERICAN OILFIELDS COMPANY,
1034 Security Bldg., Los Angeles, Cal. T. A. O'Donnell, President. Norman Bridge, Secretary. January 10, 1910. $25,000,000. Forty-seven wells, Kern County.

*AMERICAN PETROLEUM COMPANY,
1034 Security Bldg., Los Angeles, Cal. T. A. O'Donnell, President. Norman Bridge, Secretary. February 7, 1908. $10,000,000, Orig.; $15,000,000, Inc. Eighty-seven wells, Fresno County.

AMERICAN VENTURA OIL COMPANY,
452 I. W. Hellman Bldg., Los Angeles, Cal. J. M. Herndon, President. J. C. Miller, Secretary. Ventura County.

*AMITY OIL COMPANY,
607 First National Bank Bldg., San Francisco, Cal. T. P. Woodward, President. A. Whearty, Secretary. August 31, 1911. $500,000. Six wells, Fresno County.

*AMY OIL COMPANY,
Coalinga, Cal. A. P. May, President. C. E. Haliburton, Secretary. November 14, 1908. $50,000. One well, Fresno County.

ANCHOR OIL COMPANY,
Maricopa, Cal. Julius H. Preston, President. Bernard T. Lennon, Secretary. January 19, 1917. $300,000. Kern County.

ANGLO-CALIFORNIAN OIL SYNDICATE, LIMITED,
Bank of Lompoc Bldg., Lompoc, Cal. John Chapman, President. G. J. Stimson, Secretary. July 17, 1906. £50,000.

***APOLLO OIL COMPANY,**
507 Foxcroft Bldg., San Francisco, Cal. William E. Miles, President. A. J. Weston, Secretary. February 13, 1901. $20,000. Twenty wells, Kern County.

***ARCTURUS OIL COMPANY,**
55 New Montgomery St., San Francisco, Cal. Wm. Sproule, President. P. G. Williams, Secretary. February 12, 1904. $400,000. Twenty-five wells, Los Angeles County.

AREQUIPA OIL COMPANY,
58 Sutter St., San Francisco, Cal. O. Scribner, President. G. Sheridan, Secretary. January 5, 1909. $500,000. Kern County.

***ARICA OIL COMPANY,**
55 New Montgomery St., San Francisco, Cal. R. P. Schwerin, President. J. P. Edwards, Secretary. January 5, 1909. $500,000. Ten wells, Fresno County.

***ARIZONA PETROLEUM COMPANY,**
1122 Title Insurance Building, Los Angeles, Cal. J. A. Brown, President. E. W. Foogy, Secretary. March 13, 1910. $250,000. Seven wells, Fresno County.

***ASSOCIATED OIL COMPANY,**
55 New Montgomery St., San Francisco, Cal. Wm. Sproule, President. P. G. Williams, Secretary. October 7, 1901. $40,000,000. Fifty-seven wells, Fresno County; 689 wells, Kern County.

ASSOCIATED OIL COMPANY OF NEVADA,
55 New Montgomery St., San Francisco, Cal. R. P. Schwerin, President. P. G. Williams, Secretary. October 2, 1916. $25,000.

ATLANTIC AND WESTERN OIL COMPANY,
Livermore, Cal. Wm. W. French, Agent. September 14, 1917. $1,000,000.

ATLAS CRUDE OIL COMPANY,
Title Insurance Bldg., Los Angeles, Cal. G. M. Giffen, President. Theo. A. Simpson, Secretary. July 14, 1900. $30,000.

AUGUST OIL COMPANY,
P. O. Box 635, Fresno, Cal. F. A. Homan, President. A. W. Burdick, Secretary. April 4, 1910. $1,000,000.

AUGUSTINE & BUTZ,
Box 152, Coalinga, Cal.

AVENAL LAND AND OIL COMPANY,
350 California St., San Francisco, Cal. John Lawson, President. R. D. Blake, Secretary. April 20, 1899. $500,000.

AZORES OIL COMPANY,
206 N. Douty St., Hanford, Cal. M. J. Caetano, President. Wilhelmina Nunes, Secretary. January 20, 1909. $50,000.

BABY KINGS OIL AND MINERAL COMPANY,
P. O. Box 416, Hanford, Cal. F. B. Skinner, President. W. R. McQuiddy, Secretary. December 8, 1897. $64,000.

***BAKER & HENSHAW,**
Lost Hills, Cal. Two wells, Kern County.

BAKERSFIELD AND FRESNO OIL COMPANY,
Griffith-McKenzie Bldg., Fresno, Cal. H. M. Rodgers, President. F. E. Cook, Secretary. August 31, 1899. $100,000. Kern County.

BAKERSFIELD FUEL AND OIL COMPANY,
1805 Tucker St., Selma, Cal. W. H. Shafer, President. Chas. A. Lee, Secretary. July 31, 1899. $16,000.

BALBOA OIL COMPANY,
525 Spreckels Bldg., San Diego, Cal. A. J. Taylor, President. J. Wiseman, Secretary. June 10, 1912. $500,000.

BALD EAGLE JUNIOR OIL COMPANY,
P. O. Box 308, Napa, Cal. E. H. Winship, President. J. E. Beard, Secretary. February 1, 1901. $175,000.

***BALD EAGLE OIL COMPANY,**
110 Sutter St., San Francisco, Cal. C. H. Phillips, President. Wm. Lange, Jr., Secretary. January 7, 1901. $500,000. Thirteen wells, Kern County.

***BANKERS OIL COMPANY,**
703 Citizens National Bank Bldg., Los Angeles, Cal. Orra E. Monnette, President. M. J. Monnette, Secretary. November 24, 1909. $100,000. Thirty-four wells, Kern County.

***BANKLINE OIL COMPANY,**
324 Sansome St., San Francisco, Cal. John Barneson, President. J. Leslie Barneson, Secretary. May 20, 1912. $200,000. Twenty-two wells, Kern County.

BANNER OIL COMPANY,
820 Union Oil Bldg., Los Angeles, Cal. J. H. Strine, President. Ruben S. Schmidt, Secretary. September 12, 1891. $10,000.

***BARD OIL AND ASPHALT COMPANY,**
428 I. W. Hellman Bldg., Los Angeles, Cal. Edward Strasburg, Secretary. Twenty-two wells, Ventura County. (Dissolved.)

BARDSDALE CANYON OIL COMPANY,
300 Harvard Blvd., Los Angeles, Cal. Chas. F. Hurd, President. Thos. Pascoe, Secretary. May 16, 1901. $20,000.

***BARDSDALE CRUDE OIL COMPANY,**
514 Federal Bldg., Los Angeles, Cal. A. F. Schiffman, President. Chas. A. Shaw, Secretary. June 18, 1900. $200,000. Seven wells, Ventura County.

BARNODON OIL COMPANY,
310 Sansome St., San Francisco, Cal. John Barneson, President. W. J. Dinsmore, Secretary. April 9, 1910. $1,000,000.

BARSTOW SAN ANTONIO OIL COMPANY,
9 Beech St., Detroit, Michigan, care W. L. Hogan. January 16, 1915. $100,000.

BARTOLO OIL COMPANY,
831 Merchants National Bank Bldg., Los Angeles, Cal. L. P. Tappeiner, President. G. C. O'Connell, Secretary. August 7, 1916. $100,000.

BAY CITY OIL COMPANY,
30 S. Raymond Ave., Los Angeles, Cal. J. H. Dorn, President. Ira J. H. Sykes, Secretary. October 28, 1899. $500,000. Kern County.

BEAR CREEK OIL COMPANY,
19 Howard Canfield Bldg., Santa Barbara, Cal. J. L. Hurlburt, President. A. R. Edmondson, Secretary. July 12, 1913. $10,000.

***BEATTY OIL AND DEVELOPMENT COMPANY,**
930 California Bldg., Los Angeles, Cal. S. W. Beatty, President. H. M. Foster, Secretary. February 10, 1913. $470,000. Two wells, Ventura County.

***BECKER, G. F.,**
Summerland, Cal. Sixty-three wells, Santa Barbara County.

BEDROCK OIL COMPANY,
1114 Union Oil Bldg., Los Angeles, Cal. W. W. Orcutt, President. John McPeak, Secretary. January 4, 1909. $50,000.

***BEER OIL COMPANY, J. C.,**
407 First National Bank Bldg., Long Beach, Cal. J. C. Beer, President. H. Hoddenpyle, Secretary. March 23, 1912. $100,000. Three wells, Kern County. (Property now operated by E. B. Campbell, Bakersfield, Cal.)

BELL OIL COMPANY,
363 Fay Bldg., Los Angeles, Cal. C. E. Lapp, President. J. W. Eberle, Secretary. July 2, 1910. $100,000.

BELMONT OIL COMPANY,
601 D St., Chino, Cal. O. J. Newman, President. Edwin Rhodes, Secretary. September 13, 1899. $200,000.

***BELRIDGE OIL COMPANY,**
617 Merritt Bldg., Eighth and Broadway, Los Angeles, Cal. Burton E. Green, President. W. J. Hole, Secretary. January 25, 1911. $1,000,000. Eighty wells, Kern County.

BEQUETTE OIL COMPANY,
Visalia, Cal. Paschal Bequette, President. N. F. Bradley, Secretary. January 16, 1900. $9,000.

BERKELEY COALINGA OIL COMPANY,
Care of W. L. W. Miller, 340 California St., San Francisco, Cal. Fresno County.

BERKELEY PARAFFINE OIL COMPANY,
1912 Haste St., Berkeley, Cal. Geo. H. De Kay, President. P. S. Brunk, Secretary. July 6, 1912. $1,000,000.

***BERRY, F. C.,**
Selma, Cal. Five wells, Kern County.

***BERRY, C. J. AND KELLER, F. L.,**
597 Monadnock Bldg., San Francisco, Cal. Sixteen wells, Kern County.

BEST YET OIL COMPANY, THE,
Coalinga, Cal. O. D. Loftus, President. Guy H. Salisbury, Secretary. October 29, 1909. $150,000.

***BETTS, GEO A.,**
R.F.D. No. 5, Bakersfield, Cal. Kern County.

***B. H. C. OIL COMPANY,**
208 Brower Bldg., Bakersfield, Cal. C. L. Claflin, President. W. H. Hill, Secretary. September 18, 1908. $15,000. Six wells, Kern County.

BIG LAKE OIL AND GAS COMPANY,
617 Merritt Bldg., Los Angeles, Cal. Care F. B. Sutton. August 1, 1917. $100,000.

BIG SESPE OIL COMPANY OF CALIFORNIA,
609 N. Main St., Santa Ana, Cal. I. D. Mills, Secretary. September 4, 1896. $500,000. Ventura County.

***BIRCH OIL COMPANY,**
R.F.D., Fullerton, Cal. A. Otis Birch, General Manager. Seven wells, Orange County. (Co-partnership.)

BLANCK & HEASLEY,
Care of Lawton & Blanck, Inc., Fellows, Cal. Kern County.

BLUE DIAMOND OIL COMPANY,
Grass Valley, Cal. W. G. Thomas, President. L. P. Lane, Secretary. October 15, 1900. $100,000.

BOHEMIAN OIL COMPANY,
220 N. Irwin St., Hanford, Cal. L. S. Chittenden, President. A. F. Flory, Secretary. (Dissolved.)

J. S. BOOK OIL AND INVESTMENT COMPANY,
521 Washington Bldg., Los Angeles, Cal. Dr. W. P. Book, President. G. E. Delavan, Jr., Secretary. February 8, 1913. $50,000.

***BOSTON-PACIFIC OIL COMPANY,**
204-5 Sharon Bldg., San Francisco, Cal. Fred G. King, President. E. B. Cushman, Secretary. December 12, 1911. $1,000,000. Two wells, Kern County.

***BOSTON PETROLEUM COMPANY,**
131 State St., Boston, Mass. Arthur Winslow, President. Henry L. Rand, Secretary. March 21, 1910. $500,000. Fourteen wells, Kern County.

BOYCHESTER OIL COMPANY,
Coalinga, Cal. W. C. Rielly, President. J. A. Fleutsch, Secretary. May 19, 1909. $100,000.

***BRAD OIL COMPANY, LTD.,**
Box 178, Taft, Cal. E. D. Taylor, Secretary. One well, Kern County. (Property sold to Montana-Wyoming Oil Company, October 11, 1917.)

BRADFORD OIL COMPANY,
110 Market St., Room 405, San Francisco, Cal. P. G. Goode, Vice-President. Louis Nathan, Secretary. May 17, 1899. $250,000.

***BREA CAÑON OIL COMPANY,**
1117 Trust and Savings Bldg., Los Angeles, Cal. Dan Murphy, President. G. Holterhoff, Jr., Secretary. July 26, 1899. $200,000. Twenty-two wells, Orange County.

BRICELAND OIL COMPANY,
Briceland, Cal. April 22, 1913. $150.000.

BRITISH AMERICAN OIL COMPANY,
Box 598, Santa Monica, Cal. Wm. Z. McDonald, President. Robert K. Walton, Secretary. August 26, 1907. $1,250,000, Orig.; $100,000, Dec. Kern County.

BRONCHO OIL COMPANY,
637 Holbrook Bldg., 58 Sutter St., San Francisco, Cal. Chas. A. San, President. A. N. Baldwin, Secretary. November 19, 1908. $100,000.

BRONCHO OIL LEASE,
801 Garland Bldg., Los Angeles, Cal. William G. Kerckhoff, Owner. Kern County.

***BROOKS OIL COMPANY,**
Sisquoc, Cal. B. F. Brooks, President. One well, Santa Barbara County.

***BROOKSHIRE OIL COMPANY,**
San Luis Obispo, Cal. J. W. Barneberg, President. Henry Bahr, Secretary. December 1, 1902. $500,000. Four wells, Kern County; 4 wells, Santa Barbara County.

BROWN EAGLE OIL COMPANY,
300 E. Main St., Visalia, Cal. John Frans, President. J. Sub Johnson, Secretary. February 10, 1910. $75,000.

BROWN OIL COMPANY,
Care Southern Hotel, Bakersfield, Cal. P. S. Brown, President. S. L. Mack, Secretary. January 29, 1900. $250,000.

***BUENA FE PETROLEUM COMPANY,**
1015 Security Bldg., Los Angeles, Cal. T. A. O'Donnell, President. E. L. Doheny, Jr., Secretary. November 3, 1915. $10,000. Fifty-three wells, Kern County. (Property transferred to Pan-American Petroleum Company, October 18, 1917.)

BUENA VISTA OIL COMPANY,
519 Story Bldg., 610 S. Broadway, Los Angeles, Cal. J. M. McLeod, President. C. C. Barnsback, Secretary. July 23, 1914. $1,500,000. Kern County.

***BUICK OIL COMPANY,**
520 Central Bldg., Los Angeles, Cal. W. J. Fabling, Vice-President. Fred Van Orman, Secretary. March 7, 1910. $5,000,000. Two wells, Kern County.

BULL DOG OIL COMPANY,
617 Merritt Bldg., Los Angeles, Cal. M. H. Whittier, President. H. L. Westbrook, Secretary. March 6, 1911. $300,000.

BUNKER HILL OIL MINING COMPANY,
110 Sutter St., San Francisco, Cal. J. W. Wright, President. Wm. Lange, Jr., Secretary. November 9, 1899. $500.000.

E. D. BURGE OIL COMPANY,
P. O. Box 813, Bakersfield, Cal. E. D. Burge, President. C. H. Franey, Secretary. December 11, 1914. $50,000.

CALEX OIL COMPANY,
1913 Chester Ave., Bakersfield, Cal. H. A. Jastro, President. E. S. St. Clair, Secretary. August 23, 1915. $24,000. Four wells, Kern County.

CALIENTE OIL AND LAND COMPANY,
Wright & Callender Bldg., Los Angeles, Cal. Care F. E. Davis. July 17, 1916. $50,000.

CALIDON PETROLEUM SYNDICATE,
350 California St., San Francisco, Cal. Two wells, Kern County. (Operated by the Balfour-Guthrie Investment Company, R. F. MacLeod, Secretary.)

CALIFORNIA COALINGA OIL COMPANY,
Monadnock Bldg., San Francisco, Cal. Care Wm. H. H. Hart. March 27, 1917. $3,000,000. Fresno County.

***CALIFORNIA COAST OIL COMPANY,**
1114 Union Oil Bldg., Los Angeles, Cal. W. L. Stewart, President. John McPeak, Secretary. September 10, 1903. $200,000. Nine wells, Santa Barbara County.

***CALIFORNIA COUNTIES OIL COMPANY,**
58 Sutter St., San Francisco, Cal. J. E. Woodbridge, President. E. A. Richards, Secretary. February 11, 1911. $500,000. Four wells, Kern County. (Sold to General Petroleum Corporation, August 1, 1917.)

CALIFORNIA-DAKOTA OIL COMPANY,
Kerman, Cal., John Hohn, President. Walter L. Hart, Secretary. October 27, 1913. $25,000.

CALIFORNIA FRESNO OIL COMPANY,
Box 823, Fresno, Cal. A. C. Ruschhaupt, President. A. Bultner, Secretary. October 31, 1901. $50,000.

***CALIFORNIA MIDWAY OIL COMPANY,**
500 H. W. Hellman Bldg., Los Angeles, Cal. B. W. McCausland, President. J. H. Nolan, Secretary. January 13, 1912. $1,500,000. Three wells, Kern County.

CALIFORNIA MISSOURI PETROLEUM COMPANY,
108 Morgan Bldg., Bakersfield, Cal. Care Thomas Scott. December 17, 1917. $100,000.

CALIFORNIA OIL COMPANY,
532 Fifteenth St., Oakland, Cal. September 28, 1917. $4,000,000.

CALIFORNIA OIL AND ASPHALT COMPANY, THE,
242 Title Insurance Bldg., Los Angeles, Cal. Care Arthur M. Ellis. May 5, 1916. $50,000.

***CALIFORNIA OIL AND GAS COMPANY,**
Coalinga, Cal. W. M. Graham, President. Warren H. Spurge, Secretary. February 9, 1912. $1,000,000. Three wells, Fresno County.

CALIFORNIA OIL DEVELOPMENT SYNDICATE,
326 Wilcox Bldg., Los Angeles, Cal. J. D. Miller, President. Janet I. Miller, Secretary. November 15, 1916. $3,000.

CALIFORNIA OIL LAND COMPANY, THE,
Exchange National Bank Bldg., Colorado Springs, Colo. Care Oliver H. Shoup. May 17, 1912. $50,000.

CALIFORNIA RELIANCE OIL COMPANY,
317 Tajo Bldg., Los Angeles, Cal. Thurston Daniels, President. Minnie Daniels, Secretary. April 11, 1910. $1,500,000.

***CALIFORNIA STAR OIL COMPANY,**
1004 Security Bldg., Los Angeles, Cal. Thos. A. O'Donnell, President. Ellis T. Yarnell, Secretary. May 20, 1915. $2,000,000. Fifteen wells, Kern County.

CALIFORNIA WYOMING OIL COMPANY,
Box 468, Fresno, Cal. Care E. J. Crandall. April 10, 1917. $3,000.

***CALL OIL COMPANY,**
Box 516, Coalinga, Cal. D. A. Ewing, President. W. O. Miles, Secretary. January 8, 1901. $250,000. Two wells, Fresno County.

***CALLOMA OIL COMPANY,**
1913 Chester Ave., Bakersfield, Cal. H. A. Jastro, President. E. S. St. Clair, Secretary. February 15, 1904. $200.000. Five wells, Kern County.

***CALOKLA OIL COMPANY,**
537 Title Insurance Bldg., Los Angeles, Cal. H. F. Sinclair. President. E. M. Riese, Secretary. November 5, 1913. $250,000. Five wells, Orange County.

CALTRONA OIL COMPANY,
409 Hosfield Bldg., Los Angeles, Cal. Herman P. Cortelyou, President. John W. Cooke, Secretarp. January 10, 1907. $8,000.

***CALUMET OIL COMPANY,**
517 I. W. Hellman Bldg., Los Angeles, Cal. F. L. Wright, President. A. N. Gage, Secretary. April 7, 1911. $1,000,000. Six wells, Ventura County.

CAMARILLO OIL COMPANY,
210 W. Seventh St., Los Angeles, Cal. H. J. Doulton, President. L. N. Stott, Secretary. April 22, 1910. $100,000.

CAMPBELL, E. B.,
Bakersfield, Cal. (Operating property of J. C. Beer Oil Company.)

CAMERON OIL COMPANY OF CALIFORNIA,
408 Merchants Trust Bldg., Los Angeles, Cal. John Ferguson, President. H. S. McCallum, Secretary. April 23, 1914. $25,000.

***CANADIAN COALINGA OIL COMPANY, LTD.,**
739 Hastings St., West, Vancouver, B. C. E. J. McFeely, President. R. J. Cromie, Secretary. October 10, 1910. A. J. Pollak, Agt. Box 159, Maricopa, Cal. $1,500,000. One well, Fresno County.

***CANADIAN PACIFIC OIL COMPANY OF BRITISH COLUMBIA, LTD.,**
P. O. Box 27, Taft, Cal. W. H. Waddell, Field Manager. Three wells, Kern County.

CANTIN LAND, OIL AND DEVELOPMENT COMPANY,
Star Route, Sanger, Cal. Maud H. Lindsay, President. E. P. Lindsay, Secretary. February 8, 1910. $10,000.

***CAPITOL CRUDE OIL COMPANY,**
637 Consolidated Realty Bldg., Los Angeles, Cal. M. H. Sherman, President. A. I. Smith, Secretary. April 26, 1894. $300,000. Sixteen wells, Ventura County.

***CARBO PETROLEUM COMPANY,**
Box 4, Bakersfield, Cal. T. M. Young, President. G. R. Peckham, Secretary. July 15, 1909. $500,000. Ten wells, Kern County.

***CARIBOU OIL MINING COMPANY,**
435 Mills Bldg., San Francisco, Cal. H. H. Hart, President. W. J. Clark, Secretary. June 3, 1899. $1,000,000. Twenty-one wells, Fresno County; 3 wells, Kern County.

CARPENTER, JACK,
Maricopa, Cal. C. H. Treat, Manager.

CARREC OIL COMPANY,
435 Mills Bldg., San Francisco, Cal. H. H. Hart, President. W. J. Clark, Secretary. September 25, 1914. $100,000.

CARRIE NATION OIL COMPANY,
Lemoore, Cal. L. Y. Trout, President. F. B. Graves, Secretary. December 23, 1908. $25,000.

CASCADE OIL COMPANY,
906 S. Hill St., Los Angeles, Cal. H. A. Dunn, President. Stone Hastain, Secretary. April 28, 1916. $10,000.

***CASMALIA SYNDICATE,**
Sharon Bldg., San Francisco, Cal. R. P. Schwerin, President. P. G. Williams, Secretary. March 30, 1916. $1,000,000. Three wells, Santa Barbara County.

CASTLE OIL COMPANY,
1118 Hearst Bldg., San Francisco, Cal. H. A. Whitley, President. B. H. Henderson, Secretary. March 19, 1910. $600,000.

CAVE DALE OIL AND DEVELOPMENT COMPANY,
1332 Evans Ave., San Francisco, Cal. S. Pliser, President. H. Saxl, Secretary. December 8, 1914. $200,000.

CENTRAL CALIFORNIA OIL COMPANY,
1114 Union Oil Bldg., Los Angeles, Cal. Frank R. Barrett, President. May 22, 1886. $200,000.

***CENTRAL OIL COMPANY OF LOS ANGELES,**
104 H. W. Hellman Bldg., Los Angeles, Cal. I. A. Lothian, President. Robert N. Bulla, Secretary. January 2, 1900. $750,000, Orig.; $3,000,000, Inc. Fifty-three wells, Los Angeles County.

*CHANSLOR-CANFIELD MIDWAY OIL COMPANY,
Room 756, Kerckhoff Bldg., Los Angeles, Cal. E. P. Ripley, President. G. Holterhoff, Jr., Secretary. August 15, 1901. $5,000,000. One hundred thirty-four wells, Kern County.

*CHENEY STIMSON OIL COMPANY,
806 Merchants National Bank Bldg., Los Angeles, Cal. A. L. Cheney, President. December 17, 1909. $100,000. Six wells, Kern County.

CHEROKEE DEVELOPMENT COMPANY,
533 Market St., San Francisco, Cal. R. C. Dorsey, Vice-President. J. H. Bingham, Secretary. December 9, 1909. $100,000. Kern County.

CHINO OIL COMPANY,
224 H. W. Hellman Bldg., Los Angeles, Cal. E. J. Marshall, President. John F. Horton, Secretary. October 18, 1907. $50,000.

C. H. Oil COMPANY,
435 Mills Bldg., San Francisco, Cal. Wm. Chappell, President. W. J. Clark, Secretary. December 5, 1911. $100,000.

*CIRCLE OIL COMPANY,
502 Balboa Bldg., San Francisco, Cal. T. A. O'Donnell, President. O. G. Myers, Secretary. April 10, 1908. $100,000. One well, Fresno County.

*CLAMPITT, E. A., -
1037 N. Alameda St., Los Angeles, Cal. Fifteen wells, Kern County; 32 wells, Los Angeles County.

CLAMPITT, E. A. & D. L.,
1037 N. Alameda St., Los Angeles, Cal.

*CLAREMONT OIL COMPANY,
1114 Union Oil Bldg., Los Angeles, Cal. W. L. Stewart, President. R. Bruce Wallace, Secretary. January 25, 1901. $100,000. Thirteen wells, Kern County; 7 wells, Fresno County.

COALINGA CENTRAL OIL COMPANY,
1913 Chester Ave., Bakersfield, Cal. E. S. St. Clair, President. F. C. St. Clair, Secretary. April 9, 1910. $600,000.

COALINGA CROWN OIL COMPANY,
2039 Mariposa St., Fresno, Cal. September 17, 1909. $300,000.

*COALINGA EIGHT OIL COMPANY,
Box 268, Coalinga, Cal. L. V. Olcese, President. H. Steinbach, Secretary. Two wells, Fresno County (Dissolved.)

*COALINGA EMPIRE OIL COMPANY,
Care Stanley Pedder, First National Bank Bldg., San Francisco, Cal. H. A. Whitley, President. Stanley Pedder, Secretary. October 28, 1914. $1,000,000. Two wells, Fresno County.

COALINGA FOUR OIL COMPANY,
Box 154, Los Alamos, Cal. May 8, 1907. $50,000.

*COALINGA HOMESTAKE OIL COMPANY,
Box 463, Coalinga, Cal. A. P. May, President. Geo. E. H. Satchell, Secretary. July 29, 1909. $100,000. Fresno County.

COALINGA HUB OIL COMPANY,
Box 463, Coalinga, Cal. Geo. Awalt, President. Geo. E. H. Satchell, Secretary. (Dissolved.)

COALINGA LOST HILLS OIL COMPANY,
P. O. Box 154, Los Alamos, Cal. January 4, 1911. $50,000.

COALINGA LUBRICATING OIL COMPANY,
403 Citizens National Bank Bldg., Los Angeles, Cal. R. A. Collins, President. G. H. Rathman, Secretary. January 27, 1917. $100,000.

*COALINGA MOHAWK OIL COMPANY,
Room 505, 830 Market St., San Francisco, Cal. Alfred L. Meyerstein, President. J. R. Fulton, Secretary. April 15, 1907. $500,000. Four wells, Fresno County.

*COALINGA MONTEREY OIL COMPANY,
201 Main St., Salinas, Cal. E. A. Nickerson, President. Luther Rodgers, Secretary. March 17, 1910. $2,000,000. Two wells, Kern County.

COALINGA NATIONAL PETROLEUM COMPANY,
310 Sansome St., San Francisco, Cal. John Barneson, President. Virgil F. Shaw, Secretary. May 8, 1909. $500,000. Fresno County.

*COALINGA NORTH POLE OIL COMPANY,
Box 692, Fresno, Cal. L. W. Wilson, Secretary. October 2, 1909. $50,000. One well, Fresno County.

*COALINGA PACIFIC OIL AND GAS COMPANY,
607 First National Bank Bldg., San Francisco, Cal. Robert Hays Smith, President. G. J. Bliss, Secretary. August 4, 1903. $165,000. Two wells, Fresno County.

*COALINGA PEERLESS OIL COMPANY,
824 Crocker Bldg., San Francisco, Cal. Gordon Bradley, Assistant Secretary. (Property sold to Standard Oil Co.)

*COALINGA PETROLEUM COMPANY,
Coalinga, Cal. A. A. Baker, Secretary. January 23, 1905. $75,000. Five wells, Fresno County.

COALINGA SECURITY OIL COMPANY, THE,
919 Investment Bldg., Los Angeles, Cal. F. E. Woodruff, President. C. H. McWilliams, Secretary. February 25, 1910. $300,000. Fresno County. (Property leased to Union Oil Company.)

*COALINGA STAR OIL COMPANY,
1004 Security Bldg., Los Angeles, Cal. Thos. A. O'Donnell, President. Ellis T. Yarnell, Secretary. May 10, 1916. $200,000. Eleven wells, Fresno County.

*COALINGA SYNDICATE OIL COMPANY,
433 California St., San Francisco, Cal. R. K. Barrows, President. A. E. Boynton, Secretary. June 28, 1911. $2,500,000. Two wells, Fresno County.

***COALINGA UNITY OIL COMPANY,**
Sharon Bldg., San Francisco, Cal. P. G. Williams, Secretary. September 24, 1909. $200,000. Three wells, Fresno County.

COAST RANGE OIL COMPANY,
701 Washington Bldg., Los Angeles, Cal. Mary B. Cates, President. Alton M. Cates, Secretary. May 10, 1890. $1,000,000, Orig.; $10,000, Dec. Fresno County.

COLONIA OIL COMPANY OF OXNARD, CALIFORNIA,
Box A, Oxnard, Cal. A. Levy, President. R. W. Witman, Secretary. September 13, 1909. $200,000.

***COLORADO OIL COMPANY,**
Care Merchants National Bank, San Diego, Cal. Ralph Granger, President. J. E. Hasbrouck, Secretary. December 22, 1909. $200,000. Fourteen wells, Los Angeles County.

COLORADO-PACIFIC DEVELOPMENT COMPANY,
337 Deseret News Annex, Salt Lake City, Utah. J. H. Hunt, President. L. A. Maison, Secretary. December 5, 1907. $1,000,000.

***COLUMBIA OIL PRODUCING COMPANY,**
303 Tajo Bldg., Los Angeles, Cal. W. B. Scott, President. W. Astley, Secretary. May 28, 1900. $3,500,000. Forty-five wells, Los Angeles County; 61 wells, Orange County.

***COMBINED OIL COMPANY,**
849 Phelan Bldg., San Francisco, Cal. Philip C. Boardman, President. George J. Hausen, Secretary. May 29, 1911. $500,000. Eight wells, Kern County.

***COMMERCIAL PETROLEUM COMPANY,**
120 Market St., San Francisco, Cal. M. L. Woy, President. W. P. Roth, Secretary. July 27, 1896. $250,000. Seven wells, Fresno County.

COMSTOCK CRUDE OIL COMPANY,
421 Kerckhoff Bldg., Los Angeles, Cal. L. N. Comstock, President. N. J. Hudson, Secretary. November 2, 1912. $500,000.

***CONFIDENCE OIL COMPANY,**
P. O. Box 867, Fresno, Cal. D. S. Ewing, President. A. W. Burdick, Secretary. May 13, 1899. $48,000. Five wells, Fresno County.

CONSERVATIVE DEVELOPMENT COMPANY,
Care C. E. Price, Wilcox Bldg., Los Angeles, Cal. L. W. Myers, President. C. E. Price, Secretary. February 27, 1903. $200,000, Orig.; $20,000, Dec.

***CONSERVATIVE OIL COMPANY,**
2223 Nineteenth St., Bakersfield, Cal. C. Brubacher, President. E. L. Weed, Secretary. March 1, 1905. $62,500. Two wells, Kern County.

***CONSOLIDATED MUTUAL OIL COMPANY,**
541 Market St., San Francisco, Cal. Louis Titus, President. C. F. Nance, Secretary. February 16, 1914. $3,000,000. Three wells, Kern County.

CONSOLIDATED OIL AND DEVELOPMENT COMPANY,
637 Monadnock Bldg., San Francisco, Cal. Dr. L. M. F. Wanzer, President. J. C. Cullen, Secretary. August 14, 1896. $50,000.

***CONSOLIDATED OIL LANDS COMPANY,**
433 California St., San Francisco, Cal. Chas. W. Gardner, President. A. E. Boynton, Secretary. April 27, 1911. $5,000,000. Two wells, Fresno County.

***CONTINENTAL OIL AND MINERAL COMPANY,**
1055 Market St., San Francisco, Cal. M. Spiegleman, President. G. W. Forsyth, Secretary. July 14, 1914. $100,000. One well, Santa Clara County. (Property now operated by Rhoads & Schmitt.)

CONTINENTAL OIL COMPANY OF LOS ANGELES.
Care C. E. Price, Wilcox Bldg., Los Angeles, Cal. A. D. Elwell, President. C. E. Price, Secretary. December 16, 1899. $300,000.

CONTINENTAL PETROLEUM COMPANY,
Merchants Exchange Bldg., San Francisco, Cal. Care D. Hadsell. December 15, 1917. $200,000.

CONTRA COSTA OIL SYNDICATE,
Care J. E. Rodgers, Martinez, Cal. October 20, 1917. $100,000.

COPA DE ORO PETROLEUM COMPANY,
512 California Bldg., Los Angeles, Cal. G. M. Lane, President. W. A. Butterworth, Secretary. December 12, 1914. $450,000.

COPECK OIL COMPANY,
310 Sansome St., San Francisco, Cal. John Barneson, President. J. Leslie Barneson, Secretary. January 8, 1909. $500,000.

COSMO OIL COMPANY,
Box 267, Hanford, Cal. W. K. Knapp, President. F. B. Cunningham, Secretary. April 29, 1909. $100,000.

***COSMOPOLITAN OIL COMPANY,**
510 Douglas Bldg., Los Angeles, Cal. G. L. Holton, President. Robt. G. Holton, Secretary. May 1, 1912. $100,000. Two wells, Ventura County.

CRAFTON OIL COMPANY,
Mentone, Cal. J. R. Baird, Jr., President. A. R. Schultz, Secretary. February 17, 1911. $25,000.

CREE OIL COMPANY,
617 Merritt Bldg., Los Angeles, Cal. Burton E. Green, President. F. B. Sutton, Secretary. June 1, 1903. $5,000,000, Orig.; $1,000,000, Dec.

***CRESCEUS OIL COMPANY,**
579 I. W. Hellman Bldg., Los Angeles, Cal. P. E. Spellacy, President. W. M. Wallace, Secretary. March 7, 1907. $320,000. Four wells, Kern County.

CRESCENT PETROLEUM COMPANY,
408 S. Fifth St., Coalinga, Cal. Care Henry S. Richmond. February 29, 1916. $50,000.

***CRITES, ARTHUR S. (Trustee),**
Bakersfield, Cal. Eight wells, Kern County (formerly Linda Vista Oil Company); 6 wells, Kern County (formerly Piedmont Oil Company).

CROWN OF THE VALLEY OIL COMPANY,
Box 613, Pasadena, Cal. C. J. Willett, President. R. D. Badger, Secretary. March 2, 1900. $300,000. Orange County.

CROW OIL COMPANY,
2726 Hillegass Ave., Berkeley, Cal. C. E. Crow, President. R. B. Marshall, Secretary. April 25, 1900. $400,000.

CUBBON OIL COMPANY,
421 N. Main St., Santa Ana, Cal. John Cubbon, President. J. G. Quick, Secretary. September 24, 1900. $200,000.

***DABNEY & COMPANY, JOSEPH B.,**
605 Union Oil Bldg., Los Angeles, Cal. Joseph Dabney, Owner. Seventeen wells, Kern County.

DABNEY OIL COMPANY,
1126 Marsh-Strong Bldg., Los Angeles, Cal. John R. Wilson, President. John S. Mitchell, Secretary. May 31, 1901. $1,000,000. Kern County.

DAYTON OIL COMPANY OF OHIO,
371 W. First St., Dayton, Ohio. Geo. M. Smart, President. G. Frank Kuhno, Secretary. October 15, 1908. $200,000. Kern County.

***DEL REY OIL COMPANY,**
Room 6, Union Savings Bank Bldg., Pasadena, Cal. Alex. Miller, President. John C. Dalton, Secretary. December 19, 1900. $1,000,000. Nine wells, Kern County.

DEL SABLE OIL COMPANY,
530 Davis St., San Francisco, Cal. Louis Getz, President. Louis Nathan, Secretary. November 24, 1899. $250,000.

DELANEY OIL COMPANY, H. L.,
Brea, Orange County, Cal. Care Jay E. Sexton. January 25, 1918. $100,000. 000.

DE LUXE OIL COMPANY,
P. O. Box 867, Fresno, Cal. George Kaehler, President. A. W. Burdick, Secretary. December 2, 1908. $100,000.

***DEVILS DEN CONSOLIDATED OIL COMPANY,**
510 Crocker Bldg., San Francisco, Cal. Geo. T. Cameron, President. R. A. Morton, Secretary. February 2, 1900. $103,000. Twelve wells, Kern County.

DEVILS DEN DEVELOPMENT COMPANY,
Care A. H. Murray, Visalia, Cal. May 18, 1900. $125,000.

DIAMOND OIL COMPANY,
201-202 Bradbury Bldg., Los Angeles, Cal. E. R. Kellam, President. E. H. Miller, Secretary. January 17, 1916. $25,000.

DIAMOND TIP OIL COMPANY,
Reedley, Cal. G. A. Gallaher, President. Harry F. Winnes, Secretary. March 26, 1910. $12,000.

***DIAMOND VALLEY OIL COMPANY,**
626 S. Spring St., Los Angeles, Cal. Charles M. Hoff, President. Melvin Bartlett, Secretary. February 3, 1911. $1,000,000. One well, Ventura County.

DIRECTORS OIL COMPANY,
401 Union Oil Bldg., Los Angeles, Cal. E. R. Snyder, President. F. C. Lamb, Secretary. March 9, 1899. $12,000.

DIXIE OIL COMPANY,
121 E. Main St., Visalia, Cal. A. Levis, President. Adolph D. Sweet, Secretary. February 3, 1900. $100,000.

***D. J. OIL COMPANY,**
532 Fifteenth St., Oakland, Cal. B. B. Dudley, President. E. R. Arner, Secretary. June 13, 1912. $40,000. Two wells, Kern County; 2 wells, San Luis Obispo County. (Property sold to California Oil Company.)

DOAN, WHITAKER & LAYMANCE,
1432 Broadway, Oakland, Cal.

DOHENY PACIFIC PETROLEUM COMPANY,
1032 Security Bldg., Los Angeles, Cal. E. L. Doheny, President. August 15, 1917. $5,000,000. Kern County, Ventura County and Santa Barbara County.

***DOMINION OIL COMPANY,**
21-23 Drumm St., San Francisco, Cal. W. J. Moore, President. A. J. Ranken, Secretary. January 20, 1910. $250,000. Three wells, Kern County.

DORAN, BROUSE & PRICE,
456 S. Spring St., Los Angeles, Cal. E. A. Doran, President. R. Tudor, Secretary. February 12, 1903. $40,000.

DUDLEY OIL COMPANY,
261 California St., San Francisco, Cal. John C. Ils, President. William Kahn, Secretary. October 3, 1907. $10,000.

***DUDLEY PETROLEUM COMPANY, B. B. & E. R.,**
Twelfth and Franklin Sts., Oakland, Cal. E. R. Dudley, President. E. R. Arner, Secretary. March 11, 1914. $2,000,000. Thirteen wells, Kern County. (Property sold to the California Oil Company.)

***DUNHAM, A. M.,**
Box 44, Santa Paula, Cal. Three wells, Ventura County.

DUNLOP OIL COMPANY, THE,
1002 Crocker Bldg., San Francisco, Cal. C. H. Holbrook, Jr., President. Wm. L. McGuire, Secretary. November 26, 1909. $200,000. Eight wells, Kern County.

***DUQUESNE OIL COMPANY,**
124 W. Fourth St., Los Angeles, Cal. R. D. Herron, Vice President and Manager. (Company failed and lost charter.)

***EAGLE CREEK,**
519 D St., Bakersfield, Cal. W. H. Cooley, Secretary. Ten wells, Kern County. (Disincorporated; property sold to Standard Oil Company.)

EAGLE HILL OIL COMPANY,
201 Severance Bldg., Los Angeles, Cal. Chas. Kestner, President. E. V. T. Sens, Secretary. December 29, 1916. $100,000.

EAGLET OIL COMPANY,
255 Holbrook Bldg., 58 Sutter St., San Francisco, Cal. J. A. Weston, President. S. G. O. King, Secretary. February 27, 1901. $300,000, Orig.; $50,000, Dec. Kern County.

EAST OAKLAND OIL COMPANY,
1430 Twenty-third Ave., Oakland, Cal. August 28, 1908. $10,000.

EAST PUENTE ANNEX OIL COMPANY,
412 Bumiller Bldg., Los Angeles, Cal. A. L. Ellis, Vice-President. July 17, 1916. $100,000.

***EAST PUENTE OIL COMPANY,**
208 Granger Block, San Diego, Cal. Geo. R. Harrison, President. Geo. R. Rogers, Secretary. March 25, 1901. $500,000. Twenty-three wells, Kern County.

EAST SAN EMIDIO OIL LAND COMPANY,
347 Title Insurance Bldg., Los Angeles, Cal. Chas. A. Cole, President. W. S. McGiffert, Secretary. April 20, 1911. $50,000.

EAST WHITTIER OIL COMPANY,
404 H. W. Hellman Bldg., Los Angeles, Cal. W. W. Neuer, President. Robt. N. Bulla, Secretary. May 21, 1900. $250,000.

ECHO BREA OIL COMPANY,
204 Severance Bldg., Los Angeles, Cal. A. C. Labrie, President. E. V. T. Sens, Secretary. October 16, 1912. $100,000.

***EDMONDS MIDWAY OIL COMPANY,**
406 Wilcox Bldg., Los Angeles, Cal. A. B. Barret, President. C. P. Campbell, Secretary. May 27, 1910. $1,500,000. One well, Kern County.

***EIGHT OIL COMPANY, THE,**
P. O. Box OO, Bakersfield, Cal. S. P. Wible, President. Mr. Klipstein, Secretary. March 22, 1909. $50,000. Kern County.

ELAINE OIL COMPANY,
Box 207, Coalinga, Cal. March 7, 1907. $300,000.

***EL CAMINO OIL AND DEVELOPMENT COMPANY,**
228 First National Bank Bldg., Oakland, Cal. W. V. Harrington, President. A. W. Beam, Secretary. October 26, 1910. $600,000. Three wells, Kern County.

ELDEE OIL COMPANY,
Room 637, 58 Sutter St., San Francisco, Cal. Chas. G. Wilcox, President. Louis Nathan, Secretary. September 15, 1908. $500,000.

EL DORA OIL COMPANY,
Box 352, Bakersfield, Cal.

***EL DORADO OIL COMPANY,**
597 Monadnock Bldg., San Francisco, Cal. W. J. Berry, President. J. R. Murphy, Secretary. March 4, 1899. $100,000.

ELECTRA OIL COMPANY,
Room 637, Holbrook Bldg., 58 Sutter St., San Francisco, Cal. Chas. G. Wilcox, President. Louis Nathan, Secretary. November 20, 1908. $500,000.

***ELIM OIL COMPANY,**
Union Oil Bldg., Los Angeles, Cal. J. P. Willis, President. L. M. Stewart, Secretary. September 12, 1912. $50,000. One well, Ventura County.

***ELK HORN OIL COMPANY,**
Box 8, Taft, Cal. R. E. Graham, President. G. C. Patton, Secretary. March 13, 1908. $300,000. Three wells, Kern County.

ELK RIDGE OIL COMPANY,
903 Grattan St., Los Angeles, Cal. March 17, 1910. $10,000.

***ELLIOTT LEASE,**
310 Sansome St., San Francisco, Cal. Virgil F. Shaw, Secretary. Three wells, Kern County.

ELSINORE AND TEMESCAL OIL AND LAND COMPANY,
304 Bryson Bldg., Los Angeles, Cal. Care Ben White. November 10, 1913. $100,000.

***EMPIRE GAS AND FUEL COMPANY,**
410 Brower Bldg., Bakersfield, Cal. R. A. Broomfield, President. E. C. Reed, Secretary. October 9, 1912. $100,000. Two wells, Kern County.

EMPIRE OIL COMPANY,
1118 Hearst Bldg., San Francisco, Cal. H. A. Whitley, President. B. H. Henderson, Secretary. February 4, 1909. $2,000.

***EMPIRE OIL COMPANY,**
637 Consolidated Realty Bldg., Los Angeles, Cal. Five wells, Ventura County. (Co-partnership.)

ENCINAL OIL COMPANY,
414 Marsh-Strong Bldg., Los Angeles, Cal. E. S. Shattuck, President. Wm. J. Nimmo, Secretary. May 2, 1907. $1,000,000.

***ENGINEERS OIL COMPANY,**
519-21 Consolidated Realty Bldg., Los Angeles, Cal. F. C. Kingsbury, President. C. M. Dull, Secretary. March 28, 1911. $220,000. Five wells, Kern County.

ENOS OIL COMPANY,
278 Russ Bldg., San Francisco, Cal. Jno. Baker, Jr., President. I. Sutcliffe, Secretary. May 1, 1909. $500,000. Six wells, Kern County.

ENSIGN OIL COMPANY,
284 Perry St., San Francisco, Cal. E. J. Ensign, President. L. E. Ensign, Secretary. May 13, 1914. $100,000.

ENTERPRISE LAND AND OIL COMPANY,
58 Sutter St., San Francisco, Cal. J. Goldman, Treasurer-Superintendent. November 7, 1899. $200,000.

EQUITABLE PETROLEUM COMPANY,
1029 Title Insurance Bldg., Los Angeles, Cal. James Shultz, President. Donald Baker, Secretary. October 3, 1908. $100,000. Kern County.

***ETHEL D. COMPANY,**
597 Monadnock Bldg., San Francisco, Cal. C. J. Berry, President. D. S. Ewing, Secretary. September 13, 1909. $1,000,000. Twenty-one wells, Kern County.

ETZENHAUSER OIL COMPANY,
300 E. Main St., Visalia, Cal. L. Lucier, President. J. Sub Johnson, Secretary. October 13, 1909. $75,000.

***EUCLID OIL COMPANY,**
619 Union Oil Bldg., Los Angeles, Cal. M. V. McQuigg, President. A. J. Wallace, Secretary. August 8, 1900. $350,000. Six wells, Kern County.

EUREKA CRUDE OIL COMPANY,
1037 N. Alameda St., Los Angeles, Cal. Henry A. Greene, Secretary. December 26, 1916. $10,000.

EXPLORATION OIL COMPANY,
201 Sansome St., San Francisco, Cal. Dorsey Ash, President. Walter Loewy, Secretary. March 25, 1909. $200,000, Orig.; $400,000, Inc.

EXTENSION OIL COMPANY,
417 Chamber of Commerce Bldg., Los Angeles, Cal. Julius Fried, President. W. W. Worthing, Secretary. April 13, 1910. $1,000,000. Kern County.

***FAIRBANKS OIL COMPANY,**
1204 Tamalpais St., Berkeley, Cal. H. W. Fairbanks, President. Robt. H. Wetmore, Secretary.

FAIRFIELD OIL COMPANY,
30 E. Forty-second St., New York, N. Y. (Property sold August, 1916.)

FAIRFIELD PETROLEUM COMPANY,
1015 Security Bldg., Los Angeles, Cal. E. L. Doheny, Jr., President. O. D. Bennett, Secretary. April 10, 1916. $10,000. Nineteen wells, Kern County.

FAITHFUL OIL COMPANY,
1416 Nineteenth St., Bakersfield, Cal. Chas. E. Lee, Vice President. A. Weill, Secretary. May 20, 1909. $25,000.

FAR WEST OIL COMPANY,
1114 Union Oil Bldg., Los Angeles, Cal. D. T. Perkins, President. W. L. Stewart, Secretary. June 1, 1891. $50,000.

FEDERAL OIL COMPANY,
1003 Higgins Bldg., Los Angeles, Cal. John Barneson, President. John A. Ferguson, Secetary. (Dissolved.)

***FETHER, F. A.,**
Box 125. R.F.D. No. 5, Bakersfield, Cal.

***FETTERMAN OIL COMPANY,**
G. C. Fetterman, Manager, 307 Grant Bldg., Los Angeles, Cal. Three wells, Orange County. (Dissolved.)

FIVE THIRTY-SIX OIL COMPANY,
1047 Monadnock Bldg., San Francisco, Cal. June 6, 1907. $100,000. Kern County.

F. M. J. OIL COMPANY,
Box 115, Bakersfield, Cal. J. W. Briscoe, President. J. A. Hughes, Secretary. April 27, 1911. $25,000.

FORT WAYNE CALIFORNIA OIL COMPANY,
510 S. Los Robles Ave., Pasadena, Cal. W. J. Randall, President. Chas. Pfuffia, Secretary. September 30, 1908. $300,000. Kern County.

***4 OIL COMPANY,**
507 Foxcroft Bldg., San Francisco, Cal. William E. Miles, President. A. J. Weston, Secretary. April 19, 1900. $30,000. Twelve wells, Kern County.

***FOX AND GARRETT OIL COMPANY,**
R.F.D. No. 5, Bakersfield, Cal. G. S. Butler, President. R. L. Burdic, Secretary. January 3, 1910. $150,000. Two wells, Kern County.

FOX OIL COMPANY,
Lompoc, Cal. A. Lehmann, President. E. L. Walley, Secretary. November 12, 1909. $440,000. Kern County.

FRESNO MIDWAY LAND AND OIL COMPANY,
County Auditor's Office, Fresno, Cal. Care of S. L. Hogue, Secretary. February 17, 1908. $25,000.

***FULLERTON GREAT WEST OIL COMPANY,**
213 Owl Drug Bldg., San Diego, Cal. A. J. Bradley, President. W. E. Hinkle, Secretary. March 6, 1914. $500,000. Three wells, Orange County.

***FULLERTON OIL COMPANY,**
Box 34, Fullerton, Cal. Jno. J. Fay, Jr., President. W. L. Valentine, Secretary. February 26, 1907. $600,000. Nineteen wells, Orange County.

FULLERTON OIL COMPANY (Los Angeles),
831 Merchants National Bank Bldg, Los Angeles, Cal. Jno. J. Fay, Jr., President. W. L. Valentine, Secretary. May 8, 1899. $25,000.

FULTON FUEL AND ROAD OIL COMPANY,
Care A. J. Coogan, 904 Merchants Exchange Bldg., San Francisco. John B. Wandell, President. Herbert N. Leach, Secretary. January 17, 1912. $400,000. (Operated by Melita Oil Company.)

FUTURE SUCCESS OIL COMPANY,
Coalinga, Cal. R. Baker, President. A. A. Baker, Secretary. May 3, 1913. $100,000.

***GARBUTT OIL COMPANY,**
914 Merchants National Bank Bldg., Los Angeles, Cal. Frank A. Garbutt, President. Moye W. Stephens, Secretary. November 1, 1907. $500,000. Three wells, Los Angeles County.

GARNER MADISON OIL COMPANY,
1025 Citizens National Bank Bldg., Los Angeles, Cal. Care Ben S. Hunter. January 11, 1918. $75,000.

GATO RIDGE OIL COMPANY,
433 California St., San Francisco, Cal. Chas. W. Gardner, President. A. E. Boynton, Secretary. June 18, 1910. $1,000,000.

GENERAL PETROLEUM COMPANY,
1003 Higgins Bldg., Los Angeles, Cal. John Barneson, President. C. R. Stevens, Secretary. March 30, 1910. $50,000,000.

***GENERAL PETROLEUM CORPORATION,**
1003 Higgins Bldg., Los Angeles, Cal. John Barneson, President. C. R. Stevens, Secretary. May 25, 1916. $16,702,400. Twenty-two wells, Fresno County; 215 wells, Kern County; 37 wells, Orange County.

***A. F. GILMORE COMPANY,**
700 Van Nuys Bldg., Los Angeles, Cal. E. B. Gilmore, Manager and Secretary. February 3, 1915. $50,000. Twenty wells, Los Angeles County.

***GILROY OIL COMPANY,**
522 Security Bldg., Los Angeles, Cal. S. C. Graham, President. S. E. Brobst, Secretary. Six wells, Santa Clara County. (Dissolved.)

GLACIER PETROLEUM COMPANY,
501 Investment Bldg., Los Angeles, Cal. Oliver O. Clark. June 28, 1917. $9,600.

GLOBE OIL COMPANY,
619 Union Oil Bldg., Los Angeles, Cal. M. V. McQuigg, President. A. J. Wallace, Secretary. April 11, 1906. $600,000. Kern County.

GOLDEN STATE OIL COMPANY,
2334 East Twenty-seventh St., Los Angeles, Cal. S. A. Thompson, President. S. E. Keiser, Secretary. December 16, 1915. $50,000.

GOLD SEAL PETROLEUM COMPANY,
905 Haas Bldg., Los Angeles, Cal. John Rome, President. O. Park Smith, Secretary. January 19, 1915. $450,000.

***GOOD LUCK OIL COMPANY,**
948 Market St., San Francisco, Cal. James Madison, President. Albert Albrecht, Secretary. January 17, 1905. $100,000. Five wells, Fresno County.

***GOOD ROADS OIL COMPANY,**
208 Brower Bldg., Bakersfield, Cal. W. H. Hill, President. C. A. Barlow, Secretary. January 5, 1914. $50,000. Eight wells, Kern County.

GRADOR OIL COMPANY,
12 South Fair Oaks Ave., Pasadena, Cal. S. C. Graham, President. Arthur N. Gage, Secretary. August 16, 1908. $250,000.

GRAHAM-LOFTUS OIL COMPANY,
Santa Paula, Cal. S. C. Graham, President. Allan C. McKevitt, Secretary. December 19, 1898. $40,000 Orig. $1,000,000 Inc. Orange County.

***J. E. GRAY ESTATE,**
S. A. Gray, General Manager, Box 263, Bakersfield, Cal. Twenty-six wells, Kern County.

J. E. GRAY OIL COMPANY,
P. O. Box 263, Bakersfield, Cal. S. A. Gray, President. G. W. Gray, Secretary. January 13, 1909. $100,000. Twenty-six wells, Kern County.

GREAT REPUBLIC OIL AND PAINT COMPANY,
619 Brockman Bldg., Los Angeles, Cal. M. F. Tufts, Secretary.

***GUARDIAN OIL COMPANY,**
343 Sansome St., San Francisco, Cal. H. H. Beers, President. R. A. Lewin, Secretary. March 20, 1915. $500,000. Eleven wells, Fresno County.

GUTHREY OIL COMPANY,
1601 Insurance Exchange, San Francisco, Cal. G. W. McNear, Jr., President. J. P. Rothwell, Secretary. January 5, 1906. $150,000.

***HALE-McLEOD OIL COMPANY,**
926 Story Bldg., Los Angeles, Cal. Nathan W. Hale, President. F. V. Gordon, Secretary. September 29, 1909. $1,500,000. Fourteen wells, Kern County.

HAMILTON OIL & GAS COMPANY OF LOS ANGELES.
El Centro, Cal. December 28, 1908. $100,000.

HANFORD DEVIL'S DEN OIL COMPANY,
Care Hanford Water Co., Hanford, Cal. May 1, 1917. $75,000.

***HANFORD-SANGER OIL COMPANY,**
514 I. W. Hellman Bldg., Los Angeles, Cal. F. R. Dunlap, President. H. E. Woods, Secretary. January 31, 1901. $300,000. Four wells, Kern County.

HANHUTH OIL COMPANY,
Vallejo, Cal. Wm. Hanhuth, President. Minnie Hanhuth, Secretary. November 17, 1916. $50,000.

HARBOR CRUDE OIL COMPANY,
836 H. W. Hellman Bldg., Los Angeles, Cal. W. F. Young, President. C. W. DeFreest, Secretary. July 3, 1913. $1,000,000.

HARLIND OIL COMPANY,
Room 1402, Humboldt Bank Bldg., San Francisco, Cal. Chas. M. Lindsay, President. S. N. Norton, Secretary. January 27, 1910. $250,000. Kern County.

***HARRIS AND STEVENS CORPORATION,**
926 Black Bldg., Los Angeles, Cal. C. C. Harris, President. C. P. E. Menzies, Secretary. March 19, 1914. $75,000. Fourteen wells, Kern County.

C. C. HARRIS OIL COMPANY,
701 College St., Los Angeles, Cal. Mary B. Cates, President. E. R. Snyder, Secretary. February 10, 1909. $500,000.

HARTER OIL COMPANY,
322 Stimson Bldg., Third and Spring Sts., Los Angeles, Cal. Anthony Schaub, President. E. Roberts, Secretary. September 22, 1900. $250,000.

HAVILAND CRUDE OIL COMPANY,
416 Pacific Electric Bldg., Los Angeles, Cal. Care S. J. White. March 11, 1908. $25,000.

HAWAIIAN OIL COMPANY,
120 Market St., San Francisco, Cal. W. P. Roth, Secretary. June 28, 1909. $250,000. Kern County.

HAZELTON CRUDE OIL COMPANY,
Bakersfield, Cal. J. W. Kelly, President. Ida M. Kelly, Secretary. November 23, 1908. $25,000.

HENDERSON OIL COMPANY,
922 Kohl Bldg., San Francisco, Cal. Benj. Bangs, President. Thomas C. Berry, Secretary. June 19, 1908. $500,000. Santa Barbara County.

***HENDERSON UNION OIL COMPANY,**
724 S. Main St., Los Angeles, Cal. E. E. Henderson, President. W. F. Wilson, Secretary. March 20, 1911. $100,000. Four wells, Ventura County.

HENRIETTA OIL COMPANY,
821 Mills Bldg., San Francisco, Cal. Oliver Ellsworth, President. M. A. Thomas, Secretary. October 2, 1900. $200,000. Kern County.

HICKLER OIL COMPANY.
494 S. Raymond Ave., Pasadena, Cal. W. I. Hollingsworth, President. W. H. Smidden, Secretary. February 28, 1901. $200,000.

***HIDALGO OIL COMPANY.**
307 Insurance Bldg., San Francisco, Cal. F. B. Chapin, President. C. H. Sherman. Secretary. July 19, 1913. $100,000. One well, Ventura County.

HIGHLAND DEVELOPMENT COMPANY,
546 Title Insurance Bldg., Los Angeles, Cal. John W. Kinne, President. Milford Steele, Secretary. December 29, 1915. $10,000.

HIGHLAND OIL COMPANY,
Care L. L. Cory, Fresno, Cal. L. L. Cory, President. E. Owen, Secretary pro tem. October 13, 1899. $200,000.

HILLCREST OIL COMPANY,
Howard Canfield Bldg., Santa Barbara, Cal. E. H. Sawyer, President. A. R. Edmondson, Secretary. May 2, 1910. $500,000.

HILL TOP OIL COMPANY,
Santa Paula, Cal. I. B. Marhn, President. April 21, 1909. $100,000.

***HOME OIL COMPANY,**
Whittier, Cal. T. H. Buckmaster, President. Alva Starbuck, Secretary. June 19, 1897. $100,000. Thirteen wells, Los Angeles County.

HOME RANCH PETROLEUM COMPANY,
923 I. N. Van Nuys Bldg., Los Angeles, Cal. S. A. Guiberson, Jr., President. January 12, 1917. $200,000.

***HOMESTEAD DEVELOPMENT COMPANY,**
433 California St., San Francisco, Cal. Chas. W. Gardner, President. A. E. Boynton, Secretary. May 29, 1911. $500,000. Nine wells, Fresno County.

***HONDO OIL COMPANY,**
617 Merritt Bldg., Los Angeles, Cal. M. L. Whittier, President. H. L. Westbrook, Secretary. July 19, 1916. $100,000. Twelve wells, Kern County.

***HONOLULU CONSOLIDATED OIL COMPANY,**
120 Market St., San Francisco, Cal. A. C. Diericx, President. W. P. Roth, Secretary. April 19, 1910. $5,000,000. Thirty-nine wells, Kern County.

***HONOLULU OIL COMPANY,**
120 Market St., San Francisco, Cal. A. M. McCarty, President. W. P. Roth, Secretary. June 28, 1909. $250,000.

HOPKINS OIL COMPANY,
Santa Maria, Cal. W. A. Haslam, President. Geo. Beach, Secretary. July 15, 1907. $75,000.

HUMAUMA OIL COMPANY,
310 Sansome St., San Francisco, Cal. Harry B. Gregg, Vice President. F. Klamp, Secretary. April 16, 1910. $1,000,000.

HUTCHINSON PETROLEUM CORPORATION,
303 International Bank Bldg., Los Angeles, Cal. Care Roger Marchetti. November 13, 1916. $10,000.

IBEX OIL COMPANY,
701 College St., Los Angeles, Cal. Mary B. Cates, President. E. R. Snyder, Secretary. August 25, 1908. $10,000.

***IDA MAY OIL COMPANY,**
Box 58, Maricopa, Cal. Arthur Brand, Secretary.

IDEAL OIL COMPANY,
1028 Chorro St., San Luis Obispo, Cal. Care P. A. H. Arata. July 15, 1907. $50,000.

***ILLINOIS CRUDE OIL COMPANY,**
Room 25, Bank of Bakersfield Bldg., Bakersfield, Cal. T. V. Doub, President. C. E. Arnold, Secretary. July 12, 1901. $200,000. Nine wells, Kern County.

IMPERIAL OIL COMPANY,
350 Mills Bldg., San Francisco, Cal. J. J. Mack, President. H. Steinbach, Secretary. August 14, 1899. $100,000.

***INCA OIL COMPANY,**
58 Sutter St., San Francisco, Cal. Burton E. Green, President. M. B. Downing, Secretary. February 26, 1904. $100,000, Orig.; $750,000, Inc. Thirty-four wells, Fresno County.

***INDIAN AND COLONIAL DEVELOPMENT COMPANY, LIMITED, THE,**
Taft, Cal. Arthur Farish, President. W. G. Clegg, Secretary. December 22, 1911. £1,000. Twenty wells, Kern County.

INDIAN VALLEY OIL COMPANY,
San Miguel, Cal. J. T. Densmore, President. E. Bergemann, Secretary. April 22, 1909. $50,000.

***INTERSTATE OIL COMPANY,**
1011 Wright & Callender Bldg., Los Angeles, Cal. D. W. Wickersham, President. Floyd G. White, Secretary. November 14, 1913. $200,000. Three wells, Kern County.

INVESTMENT DEVELOPMENT COMPANY, THE,
406 Insurance Exchange Bldg., San Francisco, Cal. Samuel Pond, President. Albert Meyer, Secretary. January 3, 1911. $100,000.

INVESTMENT OIL COMPANY,
406 Insurance Exchange Bldg., San Francisco, Cal. S. H. Morsehead, President. Samuel Pond, Secretary. July 20, 1899. $500,000.

IOWA OIL COMPANY,
109 N. Greenleaf, Whittier, Cal. September 7, 1900. $200,000.

JOHN IRWIN OIL COMPANY,
Hueneme, Ventura County, Cal. E. O. Gerberding, Secretary. May 10, 1893. $30,000.

J. M. S. OIL LEASE,
310 Sansome St., San Francisco, Cal. Virgil F. Shaw, Secretary. Kern County.

***JACKSON OIL COMPANY,**
Reward P.O., Kern County, Cal. S. P. Wible, President. D. A. Jackson, Secretary. October 18, 1907. $50,000. Seven wells, Kern County.

JADE OIL COMPANY, THE,
1008 Security Bldg., Los Angeles, Cal. R. B. Williamson, President. Geo. L. Reynolds, Secretary. October 16, 1908. $1,000,000. Kern County. (Property leased to Empire Gas & Fuel Company and J. A. Lydell.)

***JEFFERSON OIL COMPANY,**
L. L. Richard, Owner, Coalinga, Cal. Two wells, Fresno County.

JESSE YARNELL COMPANY,
134 S. Bonnie Brae St., Los Angeles, Cal. Susan C. Yarnell, President. Catherine Yarnell, Secretary. April 8, 1907. $40,000.

***JEWETT OIL COMPANY,**
Box 205, Bakersfield, Cal. Philo L. Jewett, President. A. Weill, Secretary. August 25, 1900. $500,000. Eight wells, Kern County.

JOHNSON OIL COMPANY,
P.O. Box 1083, Fresno, Cal. E. Schwarz, President. R. D. Marshall, Secretary. December 4, 1908. $100,000.

JORDAN OIL COMPANY,
Box 193, Arcade Station, Los Angeles, Cal. James T. Jordan, President. Ralph Martin, Secretary. May 25, 1907. $100,000.

JOSEPHINE OIL COMPANY,
1131 Investment Bldg., Los Angeles, Cal. Care of C. F. Whittier. July 24, 1916. $25,000.

***JUNCTION OIL COMPANY,**
58 Sutter St., San Francisco, Cal. J. Goldman, President. S. G. O. King, Secretary. February 7, 1900. $250,000. Nine wells, Kern County.

KAISER OIL COMPANY,
1114 Union Oil Bldg., Los Angeles, Cal. W. W. Orcutt, President. John McPeak, Secretary. March 8, 1909. $100,000. Santa Barbara County.

***KALISPELL MIDWAY OIL COMPANY,**
P.O. Box 441, Bakersfield, Cal. R. O. Wilson, President. A. C. Tupman, Secretary. July 12, 1910. $250,000. Three wells, Kern County.

KANAWHA OIL COMPANY,
208 Pacific Electric Bldg., Los Angeles, Cal. John M. Sands, President. S. R. Shoup, Secretary. August 8, 1910. $500,000. One well, Kern County. (Property sold to Spellacy & Thompson.)

K. AND V. OIL COMPANY,
P.O. Box 482, Visalia, Cal. Susman Mitchell, President. A. Q. Beals, Secretary. March 1, 1909. $100,000.

***KANSAS CRUDE OIL COMPANY,**
F. L. Sawyer, Treasurer. Independence, Kansas. One well, Los Angeles County.

KAWEAH OIL DEVELOPMENT COMPANY,
P.O. Box 482, Visalia, Cal. H. A. Scott, President. A. Q. Beals, Secretary. March 22, 1909. $100,000.

KEITH AND MACK OIL COMPANY,
350 Mills, Bldg., San Francisco, Cal. A. Mack, President. H. Steinbach, Secretary. December 4, 1907. $20,000.

KEITH OIL AND LAND COMPANY,
350 Mills Bldg., San Francisco, Cal. A. Mack, President. H. Steinbach, Secretary. November 8, 1900. $200,000.

KELLOGG OIL COMPANY,
933 Van Nuys Bldg., Los Angeles, Cal. F. R. Kellogg, President. G. J. Symington, Secretary. December 9, 1910. $50,000.

KERN CANON OIL COMPANY,
P.O. Box 235, Fresno, Cal. S. R. La Rue, President. F. L. Simons, Secretary. March 6, 1900. $75,000. Kern County.

KERN CENTRAL OIL COMPANY,
Room 1012 Mills Bldg., San Francisco, Cal. W. A. Brace, President. J. W. McFaughey, Secretary. December 21, 1899. $100,000.

***KERN CROWN COMPANY,**
Box 323, Bakersfield, Cal. Catherine Sutherland, President. December 20, 1915. $20,000. Three wells, Kern County.

***KERN FOUR OIL COMPANY,**
519-21 Consolidated Realty Bldg., Los Angeles, Cal. F. C. Kingsburg, President. C. M. Dull, Secretary. May 26, 1909. $100,000. Twenty-two wells, Kern County.

KERN PETROLEUM COMPANY,
Room 43, Carson Block, Eureka, Cal. February 17, 1910. $250,000.

KERN PUNCHEN OIL COMPANY,
2033 Mariposa St., Fresno, Cal. February 27, 1913. $200,000.

KERN RIVER DRILLERS OIL COMPANY,
310 Sansome St., San Francisco, Cal. March 3, 1909. $100,000. Kern County.

KERN RIVER OIL COMPANY,
238 Merchants Exchange Bldg., San Francisco, Cal. H. A. Voorman, President. E. C. Landis, Secretary. June 29, 1899. $100,000. Kern County.

***KERN RIVER OILFIELDS OF CALIFORNIA, LIMITED, THE,**
1117 Investment Bldg., Los Angeles, Cal. Wm. Ivey, President. Reginald H. Young, Secretary. July 6, 1910. $2,908,325. Two hundred forty-nine wells, Kern County.

KERN SUNSET OIL COMPANY,
Maricopa Bank Bldg., Maricopa, Cal. March 27, 1908. $100,000 Orig. $10,000 Dec.

***KERN TRADING AND OIL COMPANY,**
65 Market St., San Francisco, Cal. W. R. Scott, President. G. L. King, Secretary. May 22, 1903. $10,000,000. One hundred sixteen wells, Fresno County; 391 wells, Kern County. (Now operated by the Southern Pacific Company, Fuel Oil Department.)

KINGS RIVER OIL COMPANY,
R.F.D. B, Box 489, Fresno, Cal. Burton Elwood, President. Mrs. J. C. Marlar, Secretary. June 5, 1899. $100,000.

KNICKERBOCKER OIL COMPANY,
60 California St., San Francisco, Cal. J. D. Spreckels, Jr., President. G. B. Waterman, Secretary. March 15, 1911. $100,000. Kern County.

***KNOB HILL OIL COMPANY,**
201 Cory Bldg., Fresno, Cal. James Porteous, President. W. J. Kittrell, Secretary. August 6, 1900. $25,000. Thirty wells, Kern County.

KOPJE OIL COMPANY,
Box 1306, Fresno, Cal. Geo. S. Waterman, President. M. M. Dearing, Secretary. January 4, 1901. $100,000. Kern County.

KRAMER CONSOLIDATED OIL COMPANY,
403 Germain Bldg., 224 S. Spring St., Los Angeles, Cal. J. J. Morris, President. D. F. Wilson, Secretary. November 2, 1900. $150,000 Orig. $600,000 Inc.

KRAMER MODEL OIL COMPANY,
Room 403 Germain Bldg., 220 S. Spring St., Los Angeles, Cal. Lester S. Moore, President. Chas. J. Merritt, Secretary. April 29, 1910. $21,000.

LA BELLE OIL COMPANY,
714 Central Bldg., Los Angeles, Cal. March 5, 1909. $100,000.

***LA BLANC OIL COMPANY, THE,**
228 First National Bank Bldg., Oakland, Cal. J. C. Downey, President. W. V. Harrington, Secretary. October 1, 1908. $250,000. Two wells, Kern County.

LABONGE, R. F.,
Kentuck Lease, Fillmore, Cal.

LACEY OIL COMPANY,
First National Bank, Hanford, Cal. J. E. Hall, President. R. V. Hall, Secretary. November 1, 1909. $500,000.

LA CORONA OIL AND ASPHALT COMPANY,
1809 Chester Ave., Bakersfield, Cal. L. V. Olcese, President. J. B. Hewitt, Secretary. October 9, 1897. $19,000.

LAGUNA OIL COMPANY,
California Fruit Bldg., Sacramento, Cal. Care Devlin & Devlin. April 19, 1917. $50,000.

LA HABRA OIL COMPANY,
119 E. Colorado St., Pasadena, Cal. L. P. Hansen, President. Leo G. MacLaughlin, Secretary. April 6, 1910. $500,000.

***LAKEPORT PETROLEUM COMPANY,**
Farmers Bank Bldg., Fresno, Cal. W. F. Chandler, President. H. H. Welsh, Secretary. May 20, 1916. $100,000. One well, Fresno County.

LAKESHORE OIL COMPANY,
510 Crocker Bldg., San Francisco, Cal. Geo. T. Cameron, President. R. A. Morton, Secretary. October 22, 1909. $750,000. (Operated by Universal Oil Company.)

LAKE VIEW ANNEX OIL COMPANY,
622 Bumiller Bldg., Los Angeles, Cal. November 21, 1910. $2,000,000.

***LAKE VIEW No. 2 OIL COMPANY,**
405 S. Hill St., Los Angeles, Cal. C. H. White, President. F. G. White, Secretary. May 11, 1910. $1,000,000. Two wells, Kern County.

***LAKE VIEW OIL COMPANY,**
1114 Union Oil Bldg., Los Angeles, Cal. W. L. Stewart, President. John McPeak, Secretary. December 9, 1908. $2,500,000. Four wells, Kern County.

LENNON OIL COMPANY,
120 W. D St., Coalinga, Cal. Care H. R. Crozier. January 15, 1907. $75,000.

LE ROY OIL COMPANY,
241 Sansome St., San Francisco, Cal. M. C. Hunter, President. Phil Heuer, Secretary. February 8, 1913. $100,000.

LIBERTY BELL OIL COMPANY,
502 First National Bank Bldg., Oakland, Cal. Care M. E. Bruner. May 5, 1916. $1,000,000.

LIBERTY OIL AND REFINING COMPANY,
812 Syndicate Bldg., Oakland, Cal. Care Peck, Bunker & Cole. October 30, 1917. $200,000.

LIGHT OIL EXTENSION COMPANY,
Room 637, 58 Sutter St., San Francisco, Cal. Louis Nathan, President. Chas. G. Wilcox, Secretary. November 25, 1908. $500,000.

***LILLIS, J. E.,**
Summerland, Cal. Ten wells, Santa Barbara County.

LINCOLN OIL COMPANY,
708 Hibernian Bldg., Los Angeles, Cal. Care John S. Steely. October 15, 1917. $10,000.

LINDA VISTA OIL COMPANY,
1206 Broadway, Oakland, Cal. E. A. Heron, President. A. H. Breed, Secretary. November 23, 1900. $250,000.

LINDSAY INCORPORATED OIL COMPANY,
Lindsay, Cal. L. A. Sturgeon, President. L. G. Stallings, Secretary. November 11, 1909. $200,000.

LION OIL COMPANY,
474 N. First St., San Jose, Cal. S. W. Waterhouse, President. Annie C. Waterhouse, Secretary. September 2, 1914. $25,000. (In process of dissolution.)

***LISCOMB & BRIDGE,**
1183 Garfield Ave., Pasadena, Cal. A. H. Liscomb, Managing Partner. Five wells, Kern County.

LITTLE JACK OIL COMPANY,
305 E. Sixth St., Hanford, Cal. Care Schnereger & Downing. May 16, 1912. $100,000.

LITTLE SESPE CONSOLIDATED OIL COMPANY,
407 Mason Bldg., Los Angeles, Cal. O. W. Roberts, President. W. P. Martin, Secretary. August 1, 1905. $30,000. Ventura County.

LOMA OIL COMPANY,
648 S. Olive St., Los Angeles, Cal. Frank A. Garbutt, President. Samuel C. Hall, Secretary. October 14, 1895. $50,000.

LOMPOC MONARCH OIL COMPANY,
349 Rialto Bldg., San Francisco, Cal. Howard A. Broughton, President. L. Huseman, Secretary. May 25, 1914. $1,000,000.

LOMPOC OIL DEVELOPING COMPANY,
Lompoc, Cal. Care F. J. Miller, Secretary. September 4, 1900. $300,000.

LOPEZ CANYON OIL COMPANY,
74 New Montgomery St., San Francisco, Cal. Care A. L. Darrow. February 14, 1907. $500,000.

LOS ALAMOS PETROLEUM COMPANY,
1004 Title Insurance Bldg., Los Angeles, Cal. Oliver C. Edwards, President. J. E. Wallis, Secretary. October 2, 1907. $500,000.

LOS ANGELES CHEROKEE OIL COMPANY,
1117 Trust and Savings Bldg., Los Angeles, Cal. Dan Murphy, President. G. Holterhoff, Jr., Secretary. (Dissolved.)

LOS ANGELES COALINGA OIL SYNDICATE,
307 Severance Bldg., Los Angeles, Cal. W. C. Elderton, President. W. W. Pedder, Secretary. July 8, 1909. $60,000.

***LOS ANGELES KERN OIL COMPANY,**
1007 Haas Bldg., Los Angeles, Cal. M. W. Harker, President. H. W. Pettebone, Secretary. December 10, 1908. $400,000. Five wells, Kern County. (Dissolved.)

LOS ANGELES OIL COMPANY,
1114 Union Oil Bldg., Los Angeles, Cal. W. L. Stewart, President. October 23, 1874. $1,000,000, Orig.; $50,000, Dec.

LOS FLORES LAND AND OIL COMPANY,
510 Crocker Bldg., San Francisco, Cal. R. N. Bishop, President. R. A. Morton, Secretary. July 25, 1902. $1,000,000. Santa Barbara County.

***LOST HILLS DEVELOPMENT COMPANY,**
National Bank of Visalia Bldg., Visalia, Cal. Daniel Calcote, President. E. C. Farnsworth, Secretary. Thirty-seven wells, Kern County. (Dissolved.)

LOST HILLS INVESTMENT COMPANY,
58 Sutter St., San Francisco, Cal. O. Scribner, Secretary. December 20, 1911. $24,000.

LOST HILLS MINING COMPANY,
510 Crocker Bldg., San Francisco, Cal. Geo. T. Cameron, President. R. A. Morton, Secretary. March 12, 1909. $36,800, Orig.; $100,000, Inc. (Operated by Universal Oil Company.)

***LOWELL OIL COMPANY,**
58 Sutter St., San Francisco, Cal. A. N. Baldwin, Secretary.

LUCILE OIL COMPANY,
P. O. Box 37, Coalinga, Cal. Ida R. Robertson, President. February 23, 1905. $50,000. Three wells, Fresno County.

LUCKY BOY OIL COMPANY,
632 Wesley Roberts Bldg., Los Angeles, Cal. C. Wesley Roberts, President. Wm. K. Weaver, Secretary. September 14, 1909. $750,000. Kern County.

***MAINE STATE OIL COMPANY,**
1001 Insurance Exchange, San Francisco, Cal. F. W. McNear, President. J. P. Rothwell, Secretary. January 16, 1900. $250,000. Four wells, Fresno County.

MAJESTIC OIL COMPANY,
Santa Maria, Cal. F. C. Twitchell, President. Geo. P. Merritt, Secretary. June 15, 1907. $500,000.

***M. & T. OIL COMPANY,**
703 Syndicate Bldg., Oakland, Cal. E. N. Moor, President. Stuart S. Hawley, Secretary. January 15, 1910. $300,000. Three wells, Kern County.

***MAMMOTH OIL COMPANY,**
597 Monadnock Bldg., San Francisco, Cal. J. R. Murphy, Assistant Secretary. Five wells, Kern County.

MANHATTAN MIDWAY OIL COMPANY,
1101 Hibernian Bldg., Los Angeles, Cal. S. E. Vermilyea, President. E. E. Edmonds, Secretary. January 2, 1909. $75,000. Kern County. (Dissolved.)

***MANLEY & McGINN,**
597 Monadnock Bldg., San Francisco, Cal. J. R. Murphy, Agent. Ten wells, Kern County.

MARATHON OIL COMPANY,
First National Bank Bldg., Dinuba, Cal. E. C. Snell, President. Karl R. Dennis, Secretary. May 19, 1909. $75,000.

MARIAN OIL COMPANY OF COALINGA,
Coalinga, Cal. O. D. Loftus, President. J. A. Fluetsch, Secretary. March 25, 1909. $150,000. Fresno County.

MARICOPA INVESTMENT COMPANY,
P. O. Box 17, Maricopa, Cal. W. J. Schultz, President. E. L. Weed, Secretary. May 25, 1910. $25,000. Kern County.

***MARICOPA NATIONAL PETROLEUM COMPANY,**
P. O. Box 411, Fresno, Cal. A. S. Cleary, President. E. V. Williams, Secretary. February 16, 1910. $400,000. Two wells, Kern County.

MARICOPA NORTHERN OIL COMPANY,
347 Title Insurance Bldg., Los Angeles, Cal. C. J. Heyler, President. M. M. Miles, Secretary. August 21, 1914. $1,000,000.

MARICOPA OIL COMPANY OF CALIFORNIA,
Napa, Cal. W. J. Schutz, President. Theo. W. Bernhard, Secretary. December 11, 1915. $100,000.

MARICOPA QUEEN OIL COMPANY,
216 Marine Bank Bldg., Long Beach, Cal. A. H. Smith, President. Otis Frey, Secretary. October 8, 1910. $1,000,000.

***MARICOPA STAR OIL COMPANY,**
1004 Security Bldg., Los Angeles, Cal. Thos. A. O'Donnell, President. Ellis T. Yarnell, Secretary. October 29, 1913. $100,000. Four wells, Kern County.

***MARICOPA 36 OIL COMPANY,**
310 Sansome St., San Francisco, Cal. O. H. Greenewald, President. Wm. Herlitz, Secretary. February 3, 1910. $250,000. One well.

MARINA OIL COMPANY,
324 Sansome St., San Francisco, Cal. John Barneson, President. J. Leslie Barneson, Secretary. November 25, 1916. $500,000.

MARION OIL COMPANY,
706 Flat Iron Bldg., San Francisco, Cal. Henry Ach, President. A. A. Power, Secretary. November 5, 1908. $600,000. Kern County.

***MASCOT OIL COMPANY,**
597 I. W. Hellman Bldg., Los Angeles, Cal. T. Spellacy, President. P. E. Spellacy, Secretary. November 11, 1901. $50,000. Thirty-six wells, Kern County.

MAXWELL OIL COMPANY,
716 Sheldon Bldg., San Francisco, Cal. A. F. L. Bell, President. Albert W. Potts, Secretary. January 27, 1910. $250,000.

***MAY, FRANK,**
801 Wenonah Ave., Pasadena, Cal. Seven wells, Kern County.

***MAY OIL COMPANY,**
409 Consolidated Realty Bldg., Los Angeles. Wm. Mead, President. L. Schenck, Secretary. May 7, 1902. $200,000. Eight wells, Kern County.

MAYS CONSOLIDATED OIL COMPANY,
307 Insurance Bldg., San Francisco, Cal. F. B. Chapin, President. C. H. Sherman, Secretary. May 19, 1911. $100,000.

***McCUTCHEN BROS.,**
Maricopa, Cal. Geo. W. McCutchen, Secretary. Eight wells, Kern County.

***McQUIGG BROS.,**
616 Union Oil Bldg., Los Angeles, Cal. H. M. McQuigg, Manager. Six wells, Kern County.

McKITTRICK EXTENSION OIL COMPANY,
1527 Nineteenth St., Bakersfield, Cal. S. P. Wible, President. C. Brower, Secretary. November 1, 1900. $350,000.

McKITTRICK FRONT OIL COMPANY,
1112 Merchants National Bank Bldg., San Francisco, Cal. W. F. Williamson, President. A. G. Dibblee, Secretary. April 29, 1910. $50,000.

***McKITTRICK OIL COMPANY,**
1527 Nineteenth St., Bakersfield, Cal. H. A. Jastro, President. C. Brower, Secretary. November 18, 1899. $500,000. Two wells, Kern County.

McKITTRICK PROSPERITY PETROLEUM COMPANY,
227 Sacramento St., San Francisco, Cal. A. R. Lord, President. C. W. Chapman, Secretary. November 20, 1900. $500,000.

***MECCA OIL COMPANY,**
Bakersfield, Cal. D. H. McConnell, President. A. D. Henderson, Secretary. April 23, 1901. $450,000. Fourteen wells, Kern County.

***MECCA OIL COMPANY No. 2,**
Bakersfield, Cal. D. H. McConnell, President. A. D. Henderson, Secretary. July 9, 1912. $100,000. Seven wells, Kern County.

***MELITA OIL COMPANY,**
607 First National Bank Bldg., San Francisco, Cal. Robert Hays Smith, President. A. Whearty, Secretary. December 23, 1915. $20,000. Fifteen wells, Kern County.

MELTON OIL COMPANY,
511 American Bank Bldg., Los Angeles, Cal. Care Paul Nourse. March 12, 1917. $50,000.

***MERCANTILE CRUDE OIL COMPANY,**
507 Grant Bldg., San Francisco, Cal. Peter Caubu, President. P. B. Stumpf, Secretary. December 18, 1900. $200,000. Three wells, Fresno County.

MERCED PARAFFINE OIL COMPANY,
Los Banos, Cal. Care A. H. Solan. June 9, 1914. $1,000,000.

MERICOS OIL COMPANY,
524 Auditorium Bldg., Los Angeles, Cal. Burton E. Green, President. Calvin C. Green, Secretary. November 7, 1901. $100,000, Orig.; $10,000, Dec.

MEXICAN ASSOCIATED OIL COMPANY,
232 S. Broadway, Los Angeles, Cal. Care Chas. L. Wilde, Secretary. April 1, 1910. $1,500,000.

MEXICAN PETROLEUM COMPANY,
1015 Security Bldg., Los Angeles, Cal. E. L. Doheny, President. O. D. Bennett, Secretary. December 20, 1900. $10,000,000.

***M. G. & P. OIL COMPANY,**
Box 34, Bakersfield, Cal. T. M. Young, Secretary. (Not operating; property leased by company returned to owners.)

MIDAS OIL COMPANY,
409 Hosfield Bldg., Los Angeles, Cal. Care H. P. Cortelyou. June 20, 1917. $20,000.

MIDGET OIL COMPANY,
60 California St., San Francisco, Cal. J. D. Spreckels, Jr., President. W. H. Hannam, Secretary. April 11, 1910. $25,000.

***MIDLAND OIL COMPANY, THE,**
1034 Security Bldg., Los Angeles, Cal. T. A. O'Donnell, President. Norman Bridge, Secretary. November 20, 1908. $100,000. Six wells, Kern County.

***MIDLANDS OILFIELDS COMPANY, LTD.,**
1034 Security Bldg., Los Angeles, Cal. T. A. O'Donnell, President. Norman Bridge, Secretary. April 15, 1910. $1,000,000. Three wells, Kern County.

MID STATE OIL COMPANY,
Bank of Italy Bldg., Santa Rosa, Cal. Care Ross Campbell. February 15, 1918. $10,000.

MIDWAY BASIN OIL COMPANY,
230 American Bank Bldg., Monrovia, Cal. Augustus G. Stearns, President. Herbert J. Evans, Secretary. April 13, 1910. $500,000.

MIDWAY COLUMBIAN OIL COMPANY, LTD.,
744 Hastings St. W., Vancouver, B. C. William A. Bauer, President. J. W. Bauer, Secretary. June 18, 1912. $500,000. Kern County.

***MIDWAY CONSOLIDATED LIMITED,**
Box 141, Fellows, Cal. C. F. Burton, President. A. L. Butcher, Secretary. October 21, 1913. £100,000. Two wells, Kern County.

MIDWAY FIELD OIL COMPANY,
Second floor, Garland Bldg., 740 S. Broadway, Los Angeles, Cal. C. E. Groat, President. Ben R. Meyer, Secretary. August 8, 1910. $1,000,000.

***MIDWAY FIVE OIL COMPANY,**
554 I. W. Hellman Bldg., Los Angeles, Cal. Edwin L. Martin, President. March 22, 1910. $1,000,000. Six wells, Kern County.

***MIDWAY GAS COMPANY,**
805 Garland Bldg., Los Angeles, Cal. A. E. Peat, Treasurer. Four wells, Kern County.

***MIDWAY NORTHERN OIL COMPANY,**
347 Title Insurance Bldg., Los Angeles, Cal. W. S. McGiffert, President. M. M. Miles, Secretary. October 15, 1910. $1,000,000. Two wells, Kern County.

***MIDWAY OIL COMPANY,**
Room 603, 310 Sansome St., San Francisco, Cal. James Ogden, President. A. Heyman, Secretary. May 4, 1901. $1,000,000. Twelve wells, Kern County.

MIDWAY OIL COMPANY OF PORTLAND,
30 Concord Bldg., Portland, Ore. A. E. Davis, Secretary. May 4, 1901. $1,000,000.

MIDWAY PACIFIC OIL COMPANY, THE,
1058 S. Flower St., Los Angeles, Cal. Philip L. Wilson, President. P. F. Schumacher, Secretary. April 18, 1910. $2,000,000. Five wells, Kern County.

***MIDWAY PEERLESS OIL COMPANY,**
617 Merritt Bldg., Los Angeles, Cal. H. M. Whittier, President. H. L. Westbrook, Secretary. February 28, 1911. $600,000. Twelve wells, Kern County.

***MIDWAY PREMIER OIL COMPANY,**
1103 Federal Realty Bldg., Oakland, Cal. A. J. Snyder, President. L. E. Bower, Secretary. March 18, 1910. $1,000,000. Nine wells, Kern County.

***MIDWAY ROYAL PETROLEUM COMPANY,**
648 S. Olive St., Los Angeles, Cal. Frank A. Garbutt, President. A. T. Jergins, Secretary. October 13, 1910. $1,000,000. Nine wells, Kern County.

***M. J. AND M. AND M. CONSOLIDATED,**
2779 Poplar St., Oakland, Cal. Bernard Ransome, President. S. C. Teal, Secretary. August 22, 1910. $2,000,000. Thirty wells, Kern County. (Property leased to Standard Oil Company.)

MILES, WILLIAM E.,
68 Post St., San Francisco, Cal.

***MILLIE FRANCIS OIL COMPANY,**
Box 8, Taft, Cal. T. O. May, Superintendent. Seven wells, Kern County.

MINORU OIL COMPANY,
310 Sansome St., San Francisco, Cal. John Barneson, President. W. J. Dinsmore, Secretary. June 2, 1909. $500,000.

***MIOCENE OIL COMPANY,**
Box 159, Maricopa, Cal. P. Welch, President. Jas. P. Sweeney, Secretary. July 5, 1912. $20,000. Two wells, Kern County.

M. K. AND T. OIL COMPANY,
201 First Savings Bank Bldg., Oakland, Cal. George D. Metcalf, President. John B. Metcalf, Secretary. January 15, 1900. $300,000. Fresno County.

***MOCAL OIL COMPANY,**
Shale, Kern County, Cal. Chas. Rittersbacher, President. Elmer Rittersbacher, Secretary. June 9, 1911. $300,000. Four wells, Kern County.

***MODELO OIL COMPANY,**
300 Crocker Bldg., San Francisco, Cal. A. F. Morrison, President. W. R. Berry, Secretary. April 26, 1898. $250,000. Nine wells, Ventura County.

MOGUL OIL COMPANY,
Visalia, Cal. Care L. C. Branch. L. Shiffert, President. L. C. Branch, Secretary. October 6, 1909. $100,000.

MONARCH OIL COMPANY,
1809 Chester Ave., Bakersfield, Cal. L. V. Olcese, President. J. B. Hewitt, Secretary. February 3, 1900. $100,000.

MONTANA FRESNO OIL COMPANY,
1245 I St., Fresno, Cal. W. M. Wyatt, President. Wm. L. Dunn, Secretary. January 14, 1900. $14,000.

MONTANA-WYOMING OIL COMPANY,
Box 966, Salt Lake City, Utah. William Spry, President. A. B. Carstensen, Secretary. October 1, 1917. $250,000.

MONTEBELLO NUMBER ONE OIL COMPANY,
Room 602, 356 S. Spring St., Los Angeles, Cal. Care Geo. A. Boden. January 4, 1918. $200,000.

***MONTEBELLO OIL COMPANY,**
433 California St., San Francisco, Cal. Chas. W. Gardner, President. A. E. Boynton, Secretary. May 5, 1909. $1,000,000. Eighty wells, Ventura County.

***MONTGOMERY, BUELAH J.,**
R.F.D. No. 1, Box 39, Bakersfield, Cal.

MORRO BAY OIL COMPANY,
San Luis Obispo, Cal. A. F. Fitzgerald, President. August Vollmer, Secretary. May 16, 1907. $10,000.

***MOUNT DIABLO OIL, MINING AND DEVELOPMENT COMPANY,**
517 Central Bldg., Los Angeles, Cal. Jas. Cullingham, President. N. K. Potter, Secretary. February 23, 1900. $500,000. Four wells, Kern County.

M. P. OIL COMPANY,
801 Baker St., Bakersfield, Cal. Arthur S. Crites, President. M. P. Flickinger, Secretary. May 8, 1909. $21,000.

MUNRO OIL COMPANY,
521 W. P. Story Bldg., Los Angeles, Cal. Geo. W. Walker, President. F. V. Gordon, Secretary. April 25, 1912. $50,000.

MURIEL OIL COMPANY,
310 Sansome St., San Francisco, Cal. John Barneson, President. J. Leslie Barneson, Secretary. April 22, 1909. $250,000.

***MURPHY, W. J.,**
2112 Truxtun Ave., Bakersfield, Cal. Two wells, Kern County.

MURPHY OIL COMPANY,
Box "M," Whittier, Cal. William H. Murphy, President. J. T. F. Baeyertz, Secretary. August 18, 1904. $2,000,000. Los Angeles County and Orange County.

***MUSCATINE OIL COMPANY,**
814 Merchants National Bank Bldg., Los Angeles, Cal. Mira Hershey, President. G. C. Macfarland, Secretary. August 3, 1908. $20,000, Orig.; $300,000, Inc. Four wells, Kern County. (Sold to Mira Hershey, who will operate under name of "Good Hope Wells.")

***MUTUAL OIL COMPANY, THE,**
1006 California Bldg., Los Angeles, Cal. G. L. Holton, President. Grace L. Stevens, Secretary. May 11, 1907. $400,000. One well, Ventura County.

***MYRICK, RUTH K. (MRS.),**
404-5 International Bank Bldg., Los Angeles, Cal. O. H. Myrick, Agent. Eight wells, Kern County.

NACIREMA OIL COMPANY,
409 Brower Bldg., Bakersfield, Cal. Robt. Law, Jr., President. E. C. Reed, Secretary. September 29, 1909. $50,000. Kern County.

NATIONAL OIL COMPANY,
627 E. Third St., Los Angeles, Cal. H. H. Schwarz, President. B. L. Schwarz, Secretary. June 15, 1915. $10,000.

***NATIONAL PACIFIC OIL COMPANY,**
1001 Higgins Bldg., Los Angeles, Cal. John Barneson, President. C. R. Stevens, Secretary. December 6, 1911. $3,500,000. Two wells, Kern County.

NATIONAL PETROLEUM COMPANY,
1003 Higgins Bldg., Los Angeles, Cal. Wm. Walker, President. C. R. Stevens, Secretary. April 24, 1913. $100,000.

NATOMA OIL COMPANY,
510 Crocker Bldg., San Francisco, Cal. W. R. Berry, President. R. A. Morton, Secretary. (Dissolved.)

NATURAL GAS AND PETROLEUM COMPANY,
532 Fifteenth St., Oakland, Cal. C. A. Brown, President. E. R. Arner, Secretary. February 3, 1917. $100,000.

***NETHERLANDS OIL COMPANY,**
1910 Mariposa St., Fresno, Cal. W. B. Holland, President. Ben Epstein, Secretary. March 5, 1909. $200,000. Three wells, Fresno County.

***NEVADA COUNTY OIL COMPANY,**
820 Union Oil Bldg., Los Angeles, Cal. D. E. Morgan, President. W. B. Robb, Secretary. September 22, 1900. $250,000. Thirteen wells, Kern County.

***NEVADA PETROLEUM COMPANY,**
1026 Crocker Bldg., San Francisco, Cal. A. D. Davis, President. G. D. Abbott, Secretary. December 23, 1908. $1,000,000, Orig.; $5,000,000, Inc.

NEW CASTAIC OIL COMPANY,
1525 Brooklyn Ave., Los Angeles, Cal. Geo. D. Alspach, President. Genevieve D. Garner, Secretary. March 18, 1909. $500,000.

***NEW CENTER OIL COMPANY,**
Room 637, 58 Sutter St., San Francisco, Cal. D. S. Bachman, President. A. N. Baldwin, Secretary. September 25, 1905. $25,000. Five wells, Kern County.

NEW ENGLAND OIL COMPANY,
119 E. Colorado St., Pasadena, Cal. M. E. Wood, President. MacD. Snowball, Secretary. April 16, 1900. $300,000.

NEW ERA OIL COMPANY,
Southern Title Bldg., San Diego, Cal. Care Sumner & May. September 30, 1916. $100,000.

NEWHALL MOUNTAIN OIL COMPANY,
210 S. Hudson Ave., Pasadena, Cal. L. D. Swartwout, President. S. L. Wallis, Secretary. October 9, 1901. $50,000.

NEW HOPE OIL COMPANY,
729 Mills Bldg., San Francisco, Cal. C. S. Loumeister, Vice-President. W. E. Dennison, Secretary. October 3, 1899. $100,000.

NEWLOVE OIL COMPANY,
1114 Union Oil Bldg., Los Angeles, Cal. W. W. Orcutt, President. John McPeak, Secretary. April 30, 1906. $1,500,000. Santa Barbara County.

NEWMAN, MORRRIS OIL AND LAND COMPANY,
1 Powell St., San Francisco, Cal. W. W. Kaye, President. Chas. J. Newman, Secretary. January 3, 1912. $500,000.

NEW MEXICO OIL COMPANY,
Ventura, Cal. Gus Mulholland, Manager.

***NEW PENNSYLVANIA PETROLEUM COMPANY,**
105 N. Broadway, Santa Maria, Cal. A. F. Fugler, President. G. M. Scott, Secretary. August 6, 1904. $500,000. Four Wells, Santa Barbara County.

***NEW SAN FRANCISCO CRUDE OIL COMPANY,**
904 I St., Fresno, Cal. H. H. Welsh, Vice President. W. J. O'Neill, Secretary. January 17, 1902. $40,000, Orig.; $150,000, Inc. Two wells, Fresno County.

***NILES LEASE COMPANY,**
1034 Security Bldg., Los Angeles, Cal. T. A. O'Donnell, President. Norman Bridge, Secretary. February 17, 1908. $1,000,000. Nine wells, Los Angeles County.

***NORTH AMERICAN OIL CONSOLIDATED,**
544 Market St., San Francisco, Cal. Louis Titus, President. C. F. Nance, Secretary. February 3, 1910. $3,000,000. Nineteen wells, Kern County.

NORTH MIDWAY OIL COMPANY,
Box 598, care Roy Jones, Santa Monica, Cal. L. W. Andrews, President. Roy Jones, Secretary. November 8, 1909. $200,000.

OAKBURN OIL COMPANY,
1003 Higgins Bldg., Los Angeles, Cal. J. W. Maddrill, President. C. R. Stevens, Secretary. February 18, 1910. $1,000,000.

***OAKLAND MIDWAY OIL COMPANY,**
612 Union Savings Bank Bldg., Oakland, Cal. James P. Taylor, Secretary. June 15, 1910. $500,000. Four wells, Kern County.

OAKLAND OIL COMPANY,
58 Sutter St., San Francisco, Cal. W. T. Sesnon, Vice President. A. J. Samuel, Secretary. September 14, 1899. $20,000.

***OAK RIDGE OIL COMPANY,**
433 California St., San Francisco, Cal. Chas. W. Gardner, President. A. E. Boynton, Secretary. January 6, 1911. $5,000,000. Two wells, Ventura County.

***OBISPO OIL COMPANY,**
P. O. Box 341, San Luis Obispo, Cal. J. W. Barneberg, President. Francis H. Throop, Secretary. February 25, 1909. $500,000. Two wells, Kern County.

OCCIDENT OIL COMPANY,
1927 Mariposa St., Fresno, Cal. Wm. Helm, President. W. O. Miles, Secretary. May 13, 1899. $32,000.

OCTAVE OIL COMPANY,
1004 Security Bldg., Los Angeles, Cal. Wm. H. Whittier, President. Thos. A. O'Donnell, Secretary. April 11, 1903. $50,000.

OHIO CRUDE OIL COMPANY,
346 Pacific Electric Bldg., Los Angeles, Cal. June 4, 1910. $300,000. Kern County.

***OIL EXPLORATION COMPANY OF CALIFORNIA,**
603 Nevada Bank Bldg., San Francisco, Cal. Jos. Errington, President. Jas. P. Sweeney, Secretary. August 8, 1910. $300,000. Five wells, Fresno County.

OILFIELDS SYNDICATE,
901 Insurance Exchange, San Francisco, Cal. A. E. Boynton, President. September 27, 1917. $250,000.

OIL LAND EXPLORATION COMPANY,
514 Humboldt Bank Bldg., San Francisco, Cal. Care H. F. Peart. February 23, 1909. $250,000.

***OJAI OIL COMPANY,**
315 Bumiller Bldg., Los Angeles, Cal. F. E. Dunlap, President. W. V. Ambrose, Secretary. June 4, 1900. $750,000. Four wells, Ventura County.

***OJAI VALLEY PETROLEUM COMPANY,**
207 Laughlin Bldg., Los Angeles, Cal. S. H. Watson, President. Jas. A. Haskett, Secretary. March 11, 1909. $750,000. Twenty wells, Kern County.

OLD KEYSTONE OIL COMPANY,
1114 Union Oil Bldg., Los Angeles, Cal. Lyman Stewart, President. John McPeak, Secretary. February 15, 1897. $100,000.

OLEMA OIL COMPANY,
824 Mills Bldg., San Francisco, Cal. Oliver Ellsworth, President. M. A. Thomas, Secretary. October 2, 1900. $200,000. Kern County.

OLEUM TERRA COMPANY,
2706 Brighton Ave., Los Angeles, Cal. E. C. Freeman, President. J. G. Todd, Secretary. January 9, 1901. $16,000.

***OLIG CRUDE OIL COMPANY,**
2827 La Salle Ave., Los Angeles, Cal. Geo. W. Walker, President. J. H. Purdy, Secretary. September 28, 1904. $500,000. Nine wells, Kern County.

OLIG LAND COMPANY,
2827 La Salle Ave., Los Angeles, Cal. Geo. W. Walker, President. J. H. Purdy, Secretary. February 14, 1908. $50,000.

***OLINDA LAND COMPANY,**
702 Equitable Bldg., Los Angeles, Cal. W. H. Bailey, Jr., President. M. Sutherland, Secretary. August 31, 1900. $2,000,000. Nine wells, Orange County.

ON TOP OIL COMPANY,
1611 Las Lunas St., Pasadena, Cal. J. F. Waterman, President-acting. V. L. O'Brien, Secretary. March 29, 1915. $25,000. Kern County.

OPHIR OIL COMPANY,
324 Sansome St., San Francisco, Cal. John Barneson, President. W. J. Dinsmore, Secretary. October 7, 1909. $100,000. Fresno County.

ORANGE OIL COMPANY,
303 Tajo Bldg., Los Angeles, Cal. W. B. Scott, President. W. Astley, Secretary. (Dissolved.)

***ORCUTT OIL COMPANY,**
Lompoc, Cal. A. Lehmann, President. J. A. Day, Secretary. December 31, 1907. $300,000. Five wells, Santa Barbara County.

OSAGE FIFTY-EIGHT OIL COMPANY,
1420 Orange Drive, Los Angeles, Cal. Care Chas. Rittersbacher. March 6, 1905. $500,000.

OTAY OIL COMPANY,
902 American National Bank Bldg., San Diego, Cal. E. S. Gilbert, President G. W. Johnston, Secretary. January 3, 1910. $125,000.

***OZARK OIL COMPANY,**
P. O. Box 564, Los Angeles, Cal. W. P. James, President. O. H. Burke, Secretary. July 18, 1907. $250,000. Three wells, Fresno County.

OZENA OIL COMPANY,
611 Story Bldg., Los Angeles, Cal. Care Alfred E. Peterson. April 17, 1916. $200,000.

***PACIFIC CRUDE OIL COMPANY,**
112 Market St., San Francisco, Cal. G. N. Easton, President. John Lee, Jr., Secretary. May 19, 1911. $750,000. Three wells, Kern County.

***PACIFIC LIGHT AND POWER CORPORATION,**
608 Pacific Electric Bldg., Los Angeles, Cal. O. V. Showers, Secretary. Forty wells, Los Angeles County. (Consolidated with Southern California Edison Company.)

***PACIFIC MIDWAY OIL COMPANY,**
822 Mills Bldg., San Francisco, Cal. B. S. Noyes, President. Benjamin Romaine, Secretary. January 31, 1910. $250,000. Four wells, Kern County.

PACIFIC OILFIELDS LIMITED,
350 California St., San Francisco, Cal. A. B. Williamson, President. F. W. Bishop, Secretary. December 23, 1907. £250,000. San Luis Obispo County and Santa Barbara County.

***PACIFIC STATES PETROLEUM COMPANY,**
P. O. Box "B2," Coalinga, Cal. G. W. Richard, President. L. L. Richard, Secretary. April 23, 1909. $300,000. One well, Fresno County.

PALLADIUM INVESTMENT COMPANY,
648 S. Olive St., Los Angeles, Cal. Frank A. Garbutt, President. A. T. Jergins, Secretary. (Dissolved.)

PALMER ANNEX OIL COMPANY,
1000 Title Insurance Bldg., Los Angeles, Cal. Shirley E. Meserve, President. J. E. Wallis, Secretary. June 5, 1909. $2,000,000.

***PALMER UNION OIL COMPANY,**
Box 202, Santa Barbara, Cal. J. M. Williamson, President. M. F. Lewis, Secretary. December 5, 1910. $10,000,000. Five wells, Kern County; 6 wells, Santa Barbara County.

PAN AMERICAN PETROLEUM COMPANY,
1015 Security Bldg., Los Angeles, Cal. E. L. Doheny, President. O. D. Bennett, Secretary. September 11, 1916. $1,000,000. Ventura County.

PAN AMERICAN PETROLEUM INVESTMENT CORPORATION,
1015 Security Bldg., Los Angeles, Cal. E. L. Doheny, President. O. D. Bennett, Secretary. October 30, 1916. $5,000,000.

***PANTHEON OIL COMPANY,**
55 New Montgomery St., San Francisco, Cal. R. P. Schwerin, President. P. G. Williams, Secretary. February 28, 1910. $750,000. Two wells, Fresno County.

***PARAFFINE OIL COMPANY,**
Box 556, Room 416, Producers Bank Bldg., Bakersfield, Cal. H. F. Condict, President. T. H. Minor, Secretary. January 24, 1901. $300,000. Five wells, Kern County.

PARAFFIN OIL PRODUCTS COMPANY,
732 Van Nuys Bldg., Los Angeles, Cal. Care E. Earl Crandall, Agent. July 26, 1917. $200,000.

PARAISO OIL COMPANY,
Syndicate Bldg., Oakland, Cal. J. E. Ennis, President. J. N. Turner, Secretary. September 18, 1914. $200,000.

***PARKER, M. C.,**
1134 W. Eighteenth St., Los Angeles, Cal. Twelve wells, Kern County.

PARKER OIL COMPANY,
208 S. Van Ness Ave., Los Angeles, Cal. Nettie A. Parker, President. M. F. Klingaman, Secretary. May 16, 1900. $250,000.

***PATRICIA OIL COMPANY.**
P. O. Box 441, Bakersfield, Cal. F. A. Carrick, President. A. C. Tupman, Secretary. May 21, 1910. $250,000. Seventeen wells, Kern County.

PAUSON OIL COMPANY,
180 Sutter St., San Francisco, Cal. S. B. Pauson, President. J. W. Pauson, Secretary. November 5, 1904. $100,000.

P. C. L. OIL COMPANY,
111 N. Church St., Visalia, Cal. Geo. T. Parr, President. John Cutler, Secretary. November 26, 1909. $100,000.

***PEERLESS OIL COMPANY,**
824 Crocker Bldg., San Francisco, Cal. T. C. Petersen, President. H. C. Park, Secretary. October 9, 1899. $1,000,000. Sixty-two wells, Kern County.

***PENN COALINGA PETROLEUM COMPANY,**
607 First National Bank Bldg., San Francisco, Cal. J. L. Boyner, President. Robt. Hays Smith, Secretary. June 26, 1905. $350,000. Ten wells, Fresno County.

PENTLAND UNION PETROLEUM COMPANY,
401 Union Oil Bldg., Los Angeles, Cal. Edward Fox, President. F. C. Lamb, Secretary. June 29, 1912. $15,000.

PERSEUS OIL COMPANY,
207 S. Broadway, Los Angeles, Cal. T. Dudley, President. W. H. Dowsing, Secretary. March 7, 1901. $200,000. Kern County.

***PETROL COMPANY, THE,**
Santa Susana, Cal. W. S. Baylis, Secretary. Ten wells, Ventura County.

***PETROLEUM COMPANY, THE,**
407-8 Consolidated Realty Bldg., Los Angeles, Cal. M. H. Mosier, President. Geo. H. Johnson, Secretary. September 30, 1910. $250,000. Four wells, Orange County.

***PETROLEUM DEVELOPMENT COMPANY,**
756 Kerckhoff Bldg., Los Angeles, Cal. E. O. Faulkner, President. G. Holterhoff, Jr., Secretary. May 26, 1899. $125,000. Seventy wells, Orange County; 11 wells, Kern County.

***PETROLEUM MIDWAY COMPANY, LTD.,**
1034 Security Bldg., Los Angeles, Cal. T. A. O'Donnell, President. Norman Bridge, Secretary. February 15, 1915. $1,000,000. Nine wells, Kern County.

PETROLEUM NORTH MIDWAY COMPANY,
1023 Crocker Bldg., San Francisco, Cal. F. W. Bradley, President. S. A. Guiberson, Jr., Secretary. Kern County. (Dissolved.)

PETROLIA OIL COMPANY,
Tulare and J Sts., Tulare, Cal. A. W. Wheeler, President. W. A. Higgins, Secretary. June 29, 1899. $50,000.

PHOENIX OIL COMPANY,
P. O. Box 416, Hanford, Cal. P. McRae, President. W. R. McQuiddy, Secretary. November 28, 1898. $100,000.

PICO OIL COMPANY,
303 Tajo Bldg., Los Angeles, Cal. W. B. Scott, President. W. Astley, Secretary. (Dissolved.)

***PIEDMONT OIL COMPANY,**
1206 Broadway, Oakland, Cal. E. A. Heron, President. H. L. Breed, Secretary. December 17, 1900. $4,000. Six wells, Kern County. (Property sold; now operated by A. S. Crites.)

PIERPONT OIL COMPANY,
149 N. Los Angeles St., Los Angeles, Cal. Wm. Hardee, President. F. W. Black, Secretary. March 29, 1909. $500,000. Twelve wells, Kern County.

***PILOT OIL COMPANY,**
607 First National Bank Bldg., San Francisco, Cal. H. J. Doulton, President. G. A. Scott, Secretary. May 9, 1908. $100,000, Orig.; $200,000, Inc. Five wells, Fresno County.

***PINAL DOME OIL COMPANY,**
Santa Maria, Cal. J. F. Goodwin, President. Geo. P. Merritt, Secretary. June 21, 1912. $360,000. Sixty-eight wells, Santa Barbara County; 10 wells, Kern County. (Property purchased by Union Oil Co.)

PINE RIDGE PETROLEUM COMPANY,
Amy Block, Coalinga, Cal. Care Henry S. Richmond. May 8, 1917. $50,000.

PIONEER MIDWAY OIL COMPANY,
411 Montgomery St., San Francisco, Cal. I. Strasburger, President. A. E. Cole, Secretary. August 17, 1907. $1,000,000.

***PIONEER MIDWAY OIL COMPANY CONSOLIDATED,**
55 New Montgomery St., San Francisco, Cal. Wm. Sproule, President. P. G. Williams, Secretary. June 13, 1910. $2,000,000. Six wells, Kern County.

PIRU OIL COMPANY,
300 Crocker Bldg., San Francisco, Cal. W. Gregg, Jr., President. W. R. Berry, Secretary. January 21, 1887. $100,000.

PITCHER & GARBUTT OIL COMPANY,
648 S. Olive St. Los Angeles, Cal. Frank A. Garbutt President. Samuel C. Hall, Secretary. (Dissolved.)

PITTSBURGH BELRIDGE OIL COMPANY,
P. O. Box 10, McKittrick, Cal. W. S. Kuhn President. Wendell S. Kuhn, Secretary. April 12, 1912. $250,000. Kern County.

PITTSBURGH PACIFIC OIL COMPANY,
410 Brower Bldg., Bakersfield, Cal. Care R. A. Broomfield. June 4, 1914. $1,000,000.

PLACENTIA OIL COMPANY,
522 Security Bldg., Los Angeles, Cal. S. E. Brobst, Secretary. November 4, 1914. $100,000. Orange County. (Dissolved.)

PLACERITA OIL COMPANY,
119 E. Colorado St., Pasadena, Cal. F. C. Melton, President. Leo G. MacLaughlin, Secretary. (Dissolved.)

PLEASANT VALLEY OIL COMPANY, LTD.,
Care Universal Oil Company, Lost Hills, Cal. T. A. Crumpton, President. I. M. Conkey, Secretary. August 16, 1911. $15,000.

PLEYTO CONSOLIDATED OIL COMPANY,
333 Kearny St., San Francisco, Cal. C. W. Jackson, President. J. C. Currier, Secretary. April 15, 1912. $400,000.

PORTOLA OIL COMPANY, THE,
798 Minnesota St., San Francisco, Cal. Care Geo. P. Moore, Agent. June 11, 1917. (No par value.)

POSO CREEK OIL COMPANY,
Care S. L. Mack, Southern Hotel, Bakersfield, Cal. S. P. Wible, President. S. L. Mack, Secretary. November 22, 1899. $100,000.

POSTON OIL COMPANY,
Box 354, Santa Clara, Cal. J. C. Sutherland, President. F. A. Birge, Secretary. October 29, 1899. $30,000.

***POTTER OIL COMPANY OF CALIFORNIA,**
410 Brower Bldg., Bakersfield, Cal. Robt. Law, Jr., President. J. H. Healey, Secretary. April 26, 1915. $500,000. Twenty-four wells, Kern County.

***PRAIRIE OIL COMPANY,**
Care Thos. M. Diviny, 244 Kearny St., San Francisco, Cal. Alex Wark, President. T. V. Daub, Secretary. April 14, 1916. $50,000. Two wells, Kern County.

PREMIER ANTIOCH OIL COMPANY,
714 Tenth St., Oakland, Cal. S. B. Reynolds, President. J. H. Somers, Secretary. August 19, 1911. $200,000.

***PREMIER OIL COMPANY,**
579 H. W. Hellman Bldg., Los Angeles, Cal. T. Spellacy, President. W. M. Wallace, Secretary. September 5, 1907. $1,000,000. Nine wells, Fresno County.

***PRICEWELL OIL COMPANY,**
Care C. E. Price Wilcox Bldg., Los Angeles, Cal. A. D. Elwell, President. C. E. Price, Secretary. March 20, 1909. $50,000. Eight wells, Kern County.

PRINCETON OIL COMPANY,
208 Brower Bldg., Bakersfield, Cal. H. A. Jastro, President. C. A. Barlow, Secretary. January 7, 1913. $50,000. Kern County.

PRODUCERS OIL COMPANY, GUARANTEED,
1945 Tulare St., Fresno, Cal. B. F. Shepherd, Jr., President. N. G. Cochrane, Secretary. October 25, 1899. $500,000. Kern County.

***PROVIDENTIAL OIL COMPANY,**
320 Timken Bldg., San Diego, Cal. F. E. Wisecup, President. J. A. Smith, Secretary. October 5, 1914. $1,000,000. Two wells, Orange County.

PROVIDENT OIL MINING COMPANY,
637 Monadnock Bldg., San Francisco, Cal. Dr. A. McFadyen, President. J. C. Cullen, Secretary. November 26, 1900. $300,000. Kern County.

PUENTE OIL COMPANY,
1005 Central Bldg., Los Angeles, Cal. Wm. R. Rowland, President. W. Astley, Secretary. January 22, 1892. $250,000.

PURE OIL COMPANY OF SANTA PAULA,
512 S. Broadway, Los Angeles, Cal. J. W. Young, President. Philip Forve, Secretary. June 4, 1900. $300,000.

PURISSIMA HILLS OIL COMPANY,
349 Rialto Bldg., San Francisco, Cal. Howard A. Broughton, President. James Casey, Secretary. October 31, 1908. $1,000,000.

PURITAN OIL COMPANY,
504 I. W. Hellman Bldg., Los Angeles, Cal. W. J. Wallace, President. Harry J. Bauer, Secretary. March 22, 1916. $100,000.

***PYRAMID OIL COMPANY,**
715 Phelan Bldg., San Francisco, Cal. G. S. Johnson, President. Otto B. Johnson, Secretary. October 7, 1909. $1,000,000. Thirteen wells, Ventura County; 5 wells, Kern County.

***QUEEN OIL COMPANY,**
Care First National Bank, Los Angeles, Cal. W. N. Hamaker, Secretary. Three wells, Fresno County.

QUINTUPLE OIL COMPANY,
338 Consolidated Realty Bldg., Los Angeles, Cal. R. J. Gaffney, President. A. E. Hurley, Secretary. July 30, 1914. $100,000. Two wells, Orange County.

RADIUM OIL COMPANY,
410 Montgomery St., San Francisco, Cal. Charles Sutro, President. Sidney L. Schwartz, Secretary. April 29, 1904. $250,000.

***RANCHO LA BREA OIL COMPANY,**
Merchants National Bank Bldg., Los Angeles, Cal. G. Allan Hancock, Executor. Fifty-seven wells, Los Angeles County.

RAMBLER OIL COMPANY,
619 Union Oil Bldg., Los Angeles, Cal. M. V. McQuigg, President. A. J. Wallace, Secretary. June 17, 1908. $50,000.

***RECORD OIL COMPANY,**
435 Mills Bldg., San Francisco, Cal. H. H. Haub, President. W. J. Clark, Secretary. March 3, 1905. $200,000. Eight wells, Fresno County.

RECOVERY OIL COMPANY,
510 Crocker Bldg., San Francisco, Cal. Geo. T. Cameron, President. R. A. Morton, Secretary. December, 1910. $1,000,000. Fresno County.

RECRUIT OIL COMPANY,
55 New Montgomery St., San Francisco, Cal. Wm. Sproule, President. P. G. Williams, Secretary. May 4, 1903. $1,000,000. Santa Barbara County.

RED MAN PETROLEUM COMPANY,
3096 California St., San Francisco, Cal. A. A. Cohn, President. W. I. Sterett, Secretary. October 27, 1911. $300,000.

REFINING AND PRODUCING OIL COMPANY,
354 Pine St., San Francisco, Cal. T. N. Barnsdall, President. R. A. Broomfield, Secretary. May 4, 1911. $2,250,000.

RED STAR PETROLEUM COMPANY,
1034 Security Bldg., Los Angeles, Cal. T. A. O'Donnell, President. W. D. Stewart, Secretary. June 8, 1917. $500,000.

REGAL OIL COMPANY,
226-227 Security Bldg., Los Angeles, Cal. E. E. Dunlap, President. G. C. Dennis, Secretary. September 12, 1908. $100,000. Kern County.

REPUBLIC OIL COMPANY,
1118 Hearst Bldg., San Francisco, Cal. S. A. Guiberson, Jr., President. B. H. Henderson, Secretary. February 2, 1910. $6,000.

RESULT OIL COMPANY,
1118 Kohn Building, San Francisco, Cal. P. E. Bowles, President. F. W. McNear, Secretary. March 6 1908. $25,000.

***REVENUE OIL COMPANY,**
409 Citizens Savings Bank Bldg., Pasadena, Cal. R. H. Pinney, President. A. K. Nash, Secretary. March 17, 1900. $200,000. Eleven wells, Kern County.

***REWARD OIL COMPANY,**
1118 Kohl Bldg., San Francisco, Cal. P. E. Bowles, President. F. W. McNear, Secretary. March 9, 1901. $100,000. Forty-two wells, Kern County.

RHOADS & SCHMITT,
Alma, Cal. Wm. Rhoads, Manager. Santa Clara County.

***RICE RANCH OIL COMPANY,**
710 Merchants National Bank Bldg., Los Angeles, Cal. C. J. Kubach, President. E. A. Rang, Secretary. March 14, 1904. $300,000. Thirteen wells, Santa Barbara County.

RICHFIELD OIL COMPANY,
933 Van Nuys Bldg., Los Angeles, Cal. T. A. Winter, President. G. J. Syminton, Secretary. November 29, 1911. $150,000.

RIO BRAVO OIL COMPANY,
Care Wm. Palmtag, Hollister, Cal. Geo. D. Clark, President. Walker C. Graves, Secretary. February 14, 1900. $100,000.

RIO HONDO PETROLEUM COMPANY,
1117 Title Insurance Bldg., Los Angeles, Cal. Care Goodwin & Morgrage. November 1, 1917. $300,000.

ROANOKE OIL COMPANY,
Room 3, Farmers National Bank, Fresno, Cal. Care G. L. Warlow, Secretary. December 24, 1900. $100,000.

***ROCK OIL COMPANY,**
1007 Washington Bldg., Los Angeles, Cal. L. C. Torrance, President. Nichols Milbank, Secretary. April 7, 1910. $125,000. Eight wells, Kern County.

ROSE OIL COMPANY,
600 S. Broadway, Los Angeles, Cal. Frederick J. Mullen, President. James B. Sullivan, Secretary. July 6, 1903. $200,000.

ROSE OIL COMPANY,
Sespe, Cal. C. E. Ingalls, President. Ventura County.

ROYAL PETROLEUM COMPANY, LTD.,
720 Story Bldg., Los Angeles, Cal. Care Murphey & Gray. June 29, 1917. $9,600.

R. T. OIL COMPANY,
Care G. S. Thurman, Madera, Cal. W. B. Thurman, President. G. S. Thurman, Secretary. September 19, 1910. $150,000.

***RUBY OIL COMPANY, THE,**
1008 Security Bldg., Los Angeles, Cal. J. M. Danziger, President. George L. Reynolds, Secretary. February 13, 1908. $40,000. Ten wells, Kern County.

***SAFE OIL COMPANY,**
208 Brower Bldg., Bakersfield, Cal. C. A. Barlow, President. W. H. Hill, Secretary. March 1, 1907. $100.000. Four wells, Kern County.

SAFETY OIL COMPANY,
Care G. E. Brinckerhoff, Delger Bldg., Fourteenth and Broadway, Oakland, Cal. G. Erwin Brinckerhoff, President. M. V. Cooley, Secretary. March 8, 1901. $300,000, Orig.; $17,500, Dec.

***SALT LAKE OIL COMPANY OF CALIFORNIA,**
55 New Montgomery St., San Francisco, Cal. Wm. Sproule, President. P. G. Williams, Secretary. November 27, 1903. $500,000. One hundred five wells, Los Angeles, County.

***SALTMARSH CANON OIL COMPANY,**
P. O. Box 44, Santa Paula, Cal. A. M. Dunham, President. F. H. Dunham, Secretary. September 24, 1902. $20,000, Orig.; $50,000, Inc. Five wells, Ventura County.

***SALVIA OIL COMPANY,**
1004 Security Bldg., Los Angeles, Cal. Thos. A. O'Donnell, President. Ellis T. Yarnell, Secretary. November 3, 1915. $10,000. Fourteen wells, Fresno County.

SAMSONIAN OIL COMPANY,
First National Bank Bldg., Oakland, Cal. Care H. B. Griffith. March 19, 1917. $25,000.

SAN ANTONIO OIL AND LAND COMPANY,
348 Hayes St., San Francisco, Cal. James R. Little. President. C. W. Jackson, Secretary. March 19, 1900. $100,000.

SAN BERNARDINO VALLEY OIL COMPANY,
San Bernardino, Cal. Care A. E. Perris. December 2, 1912. $25,000.

SAN CARLOS OIL COMPANY,
200 McAllister St., San Francisco, Cal. February 19, 1892. $1,000,000, Orig.; $100,000, Dec.

SAN DIEGO AND IMPERIAL VALLEY OIL COMPANY,
American Bank Bldg., San Diego, Cal. Care Bernard & Macomber. March 21, 1917. $25,000.

***SAN DIEGO CONSOLIDATED OIL COMPANY,**
Owl Drug Bldg., San Diego, Cal. P. M. Johnson, President. George H. Hughes, Secretary. May 3, 1915. $500,000. Two wells, Orange County.

SAN DIEGO OIL COMPANY,
Care John F. McVean, 2637 Logan Ave., San Diego, Cal. John F. McVean, President. H. C. Barnes, Secretary. October 28, 1916. $50,000.

***SAN FRANCISCO AND McKITTRICK OIL COMPANY,**
607 Monadnock Bldg., San Francisco, Cal. H. U. Maxfield. President. Walter C. Beatie, Secretary. December 11, 1899. $500,000. Seventeen wells, Kern County.

SAN FRANCISCO AND WYOMING OIL COMPANY,
67 Buena Vista Terrace, San Francisco, Cal. F. J. Baird, President. Wm. J. Drew, Secretary. August 15, 1913. $200,000.

***SAN FRANCISCO MIDWAY OIL COMPANY,**
660 Market St., San Francisco, Cal. G. F. Lyon, President. W. S. Oliver, Secretary. March 25, 1910. $500,000. One well, Kern County.

SAN FRANCISCO OSAGE OIL AND GAS COMPANY,
617 Merritt Bldg., Los Angeles, Cal. W. M. Graham, President. F. B. Sutton, Secretary. (Dissolved.)

SAN GABRIEL PETROLEUM COMPANY,
1117 Title Insurance Bldg., Los Angeles, Cal. Care Goodwin & Morgrage. June 28, 1917. $100,000.

SAN JUAN OIL COMPANY,
1910 Mariposa St., Fresno, Cal. Ben Epstein, Secretary. March 5, 1909. $250,000. Fresno County.

***SANTA CLARA OIL AND DEVELOPMENT COMPANY,**
719 Story Bldg., Los Angeles, Cal. L. C. Throop, President. C. A. Nelson, Secretary. February 9, 1912. $1,000,000. One well, Ventura County.

SANTA MARIA CRUDE OIL COMPANY, 316 Bumiller Bldg., Los Angeles, Cal. W. V. Ambrose, President. Chas. F. Off, Secretary. December 29, 1906. $500,000.

SANTA MARIA ENTERPRISE OIL COMPANY, 613 Hibernian Bank, Los Angeles, Cal. G. E. Bittinger, President. E. L. Brock, Secretary. December 15, 1909. $400,000.

***SANTA MARIA OILFIELDS, INC.,** Box 638, Santa Maria, Cal. Carroll W. Gates, President. Jay Spence, Secretary. March 14, 1916. $2,250,000. Four wells, Santa Barbara County.

***SANTA PAULA OIL COMPANY,** 433 California St., San Francisco, Cal. H. R. Edwards, President. A. E. Boynton, Secretary. October 13, 1916. $100,000. One well, Santa Barbara County.

SANTA PAULA Y SATICOY OIL COMPANY, 319 Kohl Bldg., San Francisco, Cal. William Whitney, President. A. C. Hellman, Secretary. March 28, 1903. $100,000.

SANTA SUSANA OIL CORPORATION, 1101 Hollingsworth Bldg., I. H. Lehman, President. Herbert M. De Lanoie, Secretary. Los Angeles, Cal. November 30, 1917. $3,000,000.

***SANTA SUSANA SYNDICATE,** 1101 Hollingsworth Bldg., Los Angeles, Cal. Dr. A. Hirschi, President. Eleven wells, Ventura County. (Property taken over by Santa Susana Oil Corporation.)

***SAUER DOUGH OIL COMPANY,** 510 Crocker Bldg., San Francisco, Cal. Geo. T. Cameron, President. R. A. Morton, Secretary. January 7, 1901. $50,000. Fresno County.

***SCARAB OIL COMPANY,** 344 Fifth St., Oxnard, Cal. W. L. Dunn, President. H. R. Staples, Secretary. March 1, 1909. $100,000. Two wells, Ventura County. (Property of Union Oil Company; pumped by Scarab Oil Company on royalty.)

SEABOARD OIL AND TRANSIT COMPANY, 1101 Story Bldg., Los Angeles, Cal. C. L. Flack, President. C. A. Goodrich, Secretary. December 28, 1911. $1,000,000.

***SEASIDE OIL COMPANY,** Summerland, Cal. H. J. Hart, President. L. C. Cook, Secretary. February 24, 1898. $200,000. Orig.; $10,000 Dec. Seven wells, Santa Barbara County.

***SECTION FIVE OIL COMPANY,** 255 Holbrook Bldg., San Francisco, Cal. F. L. Lezinsky, President. S. G. O. King, Secretary. December 3, 1900. $75,000, Orig.; $150,000, Inc. Eight wells, Kern County.

SECTION ONE OIL COMPANY, 502 Balboa Bldg., San Francisco, Cal. T. A. O'Donnell, President. O. G. Myers, Secretary. August 14, 1907. $10,000.

***SECTION SEVEN OIL COMPANY,** 607 First National Bank Bldg., San Francisco, Cal. W. J. Boiner, President. H. E. Sherbley, Secretary. June 26, 1905. $300,000. Six wells, Fresno County.

SECTION THREE OIL COMPANY, Care G. S. Thurman, Madera, Cal. W. B. Thurman, President. G. S. Thurman, Secretary. February 23, 1911. $150,000.

SECTION TWELVE OIL COMPANY, Care Jordan & Jordan, Bakersfield, Cal. April 4, 1911. $50,000.

***SECTION TWENTY-FIVE OIL COMPANY,** 208 Brower Bldg., Bakersfield, Cal. T. E. Sullivan, President. C. A. Barlow, Secretary.. September 28, 1903. $40,000. Thirty-two wells, Kern County.

***SECURITY DEVELOPMENT COMPANY,** P. O. Box 813, Bakersfield, Cal. E. D. Burge, President. C. H. Franey, Secretary. April 29, 1913. $50,000. Nine wells, Kern County.

SECURITY OIL COMPANY, 1004 Title Insurance Bldg., Los Angeles, Cal. Care E. A. Hawkins. October 19, 1916. $200,000. Kern County.

***SENECA OIL COMPANY,** 1133 Divisadero St., Fresno, Cal. Geo. L. Warlow, President. W. T. Knowles, Secretary. April 20, 1908. $250,000. Five wells, Fresno County.

***SESNON OIL COMPANY,** 58 Sutter St., San Francisco, Cal. W. T. Sesnon, President. G. W. Fanning, Secretary. February 17, 1908. $100,000. Fifteen wells, Kern County.

SHANDON OIL COMPANY, P. O. Box 400, Caldwell, N. J. Alexander Dallas, President. P. Beaton, Secretary. February 19, 1913. $750,000. Fresno County.

SHAW RANCH OIL COMPANY, Box 638, Santa Maria, Cal. Oliver C. Edwards, President. Jay Spence, Secretary. September 18, 1912. $2,000,000. Santa Barbara County.

***SHAWMUT OIL COMPANY,** 697 First National Bank Bldg., San Francisco, Cal. Allen T. Borst, Secretary. Three wells, Fresno County. (Dissolved.)

SHEAR PETROLEUM COMPANY, 2827 La Salle Ave., Los Angeles, Cal. H. H. Argue, President. Ellen A. Stoppard, Secretary. January 3, 1910. $100,000. Seven wells, Kern County. (Property purchased by Wesco Petroleum Company.)

***SHELL COMPANY OF CALIFORNIA,** 343 Sansome St., San Francisco, Cal. W. Meischke-Smith, President. R. A. Lewin, Secretary. July 30, 1915. $45,000,000. One hundred sixty-nine wells, Fresno County.

SHIRLEY OIL COMPANY,
421 N. Main St., Santa Ana, Cal. John W. Shirley, President. J. G. Quick, Secretary. January 7, 1903. $10,000.

SHREEVES OIL COMPANY, THE,
55 New Montgomery St., San Francisco, Cal. Wm. Sproule, President. P. G. Williams, Secretary. July 28, 1906. $200,000.

SIBYL OIL COMPANY,
1003 Higgins Bldg., Los Angeles, Cal. J. W. Maddrill, President. C. R. Stevens, Secretary. October 11, 1909. $50,000. Kern County.

SILVER TIP OIL COMPANY,
305 Fifth St., Coalinga Cal. February 25, 1909. $750.

SIXTEEN OIL COMPANY,
Room 504, 411 S. Main St., Los Angeles, Cal. February 15, 1917. $100,000.

***SLOCUM, THOS. A.,**
543 Bradbury Bldg., Los Angeles, Cal. Twelve wells, Ventura County.

***SNOOK, WALTER,**
Maricopa, Cal. Kern County.

SOUTH COAST OIL COMPANY,
349 Rialto Bldg., San Francisco, Cal. James Casey, President. L. E. Gardner, Secretary. July 10, 1913. $1,000,000.

SOUTHEASTERN LIMITED OIL COMPANY,
Room 637, 58 Sutter St., San Francisco, Cal. Louis Nathan, President. Chas. G. Wilcox, Secretary. September 30, 1908. $500,000.

SOUTHERN CALIFORNIA EDISON COMPANY,
120 East Fourth St., Los Angeles, Cal. Los Angeles County.

***SOUTHERN CALIFORNIA GAS COMPANY,**
805 Garland Bldg., Los Angeles, Cal. A. E. Peat, Treasurer and Comptroller. Five wells, Kern County.

SOUTHERN CALIFORNIA OIL SYNDICATE, LTD.,
Bank of Lompoc Bldg., Lompoc, Cal. Magnus Nevwat, President. Matthew H. Adams, Secretary. April 23, 1907. £25,000.

SOUTHERN PACIFIC COMPANY,
65 Market St., San Francisco, Cal. Wm. Sproule, President. A. D'Heur, Manager Fuel Oil Department. One hundred thirty-nine wells, Fresno County; 446 wells, Kern County.

SOUTHERN PETROLEUM COMPANY OF CALIFORNIA, THE,
1113 Hibernian Bldg., Los Angeles, Cal. Care Lyle W. Rucker. January 7, 1918. $1,000,000.

SOUTH MIDWAY OIL COMPANY,
410 Chamber of Commerce Bldg., Los Angeles, Cal. Julius Fried, President. W. W. Worthing, Secretary. April 15, 1910. $1,000,000.

SOUTH MOUNTAIN OIL COMPANY,
435 Security Bldg., Los Angeles, Cal. R. Mansard, President. A. L. Jamison, Secretary. October 20, 1913. $300,000.

***SOUTH PACIFIC OIL COMPANY,**
637 Consolidated Realty Bldg., Los Angeles, Cal. A. I. Smith, Manager. Eleven wells, Ventura County.

***SOVEREIGN OIL COMPANY,**
585 Market St., San Francisco, Cal. William Ellery, President. J. W. Ellery, Secretary. October 15, 1900. $500,000. Ten wells, Kern County.

***SPINKS CRUDE OIL COMPANY,**
P. O. Box 598, Monrovia, Cal. Wm. A. Spinks, President. Walter F. Dunn, Secretary. November 3, 1909. $200,000. Seven wells, Fresno County.

S. P. PLACER MINING COMPANY,
1511 Eighteenth St., Bakersfield, Cal. M. A. Lindberg, President. Fred Gunther, Secretary. September 8, 1899. $200,000.

***SPRECKELS OIL COMPANY,**
60 California St., San Francisco, Cal. J. D. Spreckels, Jr., President. G. B. Waterman, Secretary. November 1, 1911. $200,000. Four wells, Kern County.

SQUAW FLAT OIL COMPANY,
401 Union Oil Bldg., Los Angeles, Cal. A. J. Aber, President. B. M. Howe, Secretary. August 11, 1910. $200,000.

***STANDARD OIL COMPANY,**
Standard Oil Bldg., San Francisco, Cal. W. S. Rheem, President. H. M. Storey, Secretary. September 10, 1879. $100,000,000. Three hundred thirty wells, Kern County; 105 wells, Fresno County; 109 wells, Los Angeles County; 63 wells, Orange County.

***STATE CONSOLIDATED OIL COMPANY,**
912 Baker-Detwiler Bldg., Los Angeles, Cal. E. J. Miley, President. A. M. Buley, Secretary. March 3, 1911. $1,250,000. Thirty-one wells, Kern County; 1 well, Ventura County.

STATE OIL COMPANY OF CALIFORNIA,
310 Sansome St., San Francisco, Cal. John Barneson, President. J. Leslie Barneson, Secretary. February 15, 1910. $200,000.

***STAUFFER OIL COMPANY,**
624 California St., San Francisco, Cal. C. de Guigne, President. C. Jantzen, Secretary. May 19, 1909. $100,000. Six wells, Kern County.

STEPHENS DRILLING ACCOUNT,
Merchants National Bank Bldg., Los Angeles, Cal. Moye W. Stephens, Manager. Los Angeles County.

***STERLING OIL AND DEVELOPMENT COMPANY,**
55 New Montgomery St., San Francisco, Cal. R. P. Schwerin, President. P. G. Williams, Secretary. October 30, 1899. $250,000. Forty-one wells, Kern County.

***ST. HELENS PETROLEUM COMPANY, LTD., The,**
1117 Investment Bldg., Los Angeles, Cal. H. H. Haldin, Chairman. R. H. Young, Secretary. H. W. Orwig, Los Angeles Secretary. May 10, 1913. $1,200,000. Eighteen wells, Kern County; 14 wells, Orange County.

***ST. LAWRENCE OIL COMPANY,**
411 Montgomery St., San Francisco, Cal. I. Strassburger, President. A. E. Cole, Secretary. April 14, 1908. $100,000. Seven wells, Kern County.

***STOCKTON MIDWAY OIL COMPANY,**
309 E. Main St., Stockton, Cal. Geo. F. Hudson, President. C. F. Campbell, Secretary. December 8, 1910. $1,000,000. Five wells, Kern County.

***ST. PAUL CONSOLIDATED OIL COMPANY,**
1133 Divisadero St., Fresno, Cal. Geo. L. Warlow, President. W. T. Knowles, Secretary. September 24, 1910. $600,000. Seven wells, Fresno County.

ST. PAUL-FRESNO OIL COMPANY,
1133 Divisadero St., Fresno, Cal. Geo. L. Warlow, President. W. T. Knowles, Secretary. June 5, 1903. $250,000.

***STRONG OIL COMPANY,**
1015 Marsh-Strong Bldg., Los Angeles, Cal. Frank P. Strong (one-fourth owner). Four wells, Fresno County. (Copartnership.)

STURGEON OIL COMPANY,
Care J. A. Turner, Santa Ana, Cal. J. A. Turner, President. I. D. Mills, Secretary. January 11, 1901. $300,000, Orig.; $50,000, Dec. Kern County.

SUBMARINE OIL COMPANY,
Santa Barbara, Cal. Care Santa Barbara Abstract Company. August 25, 1917. $25,000.

***SUCCESSUS OIL COMPANY,**
1526-32 Twentieth St., Bakersfield, Cal. Louis V. Olcese, President. Gus Schamblin, Secretary. October 6, 1911. $150,000. One well, Kern County.

SUDDEN & EMSLIE,
Care R. C. Sudden, Ventura, Cal.

SUDDEN OIL COMPANY,
Lompoc, Cal. T. F. Fox, President. John C. Lind, Secretary. March 5, 1910. $300,000.

SULFHUR MOUNTAIN PETROLEUM COMPANY,
Fullerton Cal. Care Wm. Starbuck. July 13, 1900. $800,000.

SUNBEAM OIL COMPANY,
724 Trust and Savings Bldg., Los Angeles, Cal. R. B. Blodget, President. Nichols Milbank, Secretary. July 17, 1916. $100,000. Kern County.

SUNCREST OIL COMPANY,
617 Merritt Bldg., Los Angeles, Cal. Burton E. Green, President. F. B. Sutton, Secretary. September 5, 1916. $50,000.

SUNPARK OIL COMPANY,
617 Merritt Bldg., Eighth and Broadway, Los Angeles, Cal. Burton E. Green, President. F. B. Sutton, Secretary. December 19, 1910. $100,000.

SUNSET EXTENSION OIL COMPANY,
208 N. Broadway, Los Angeles, Cal. Harry M. Wier, President. Geo. E. Mills, Secretary. May 23, 1910. $300,000.

***SUNSET MONARCH OIL COMPANY,**
60 California St., Los Angeles, Cal. G. P. Ayers, President. Geo. A. Douglass, Secretary. December 10, 1906. $500,000. Thirty-five wells, Kern County. (Property leased to Standard Oil Company February 14, 1917.)

SUNSET OIL COMPANY, THE,
719 State St., Santa Barbara, Cal. F. A. Conant, President. Y. C. Hassinger, Secretary. June 21, 1899. $50,000. Kern County.

SUNSET ROAD OIL COMPANY,
Box 478, Maricopa, Cal. John Bennett, President. E. R. Hough, Secretary. June 22, 1905. $2,500,000. Kern County.

SUNSHINE OIL COMPANY,
Woodland, Cal. Care J. M. Day. July 15, 1910. $150,000.

SURF OIL COMPANY,
1114 Union Oil Bldg., Los Angeles, Cal. W. L. Stewart, President. John McPeak, Assistant Secretary. December 19, 1902. $500,000.

SUSSEX OIL COMPANY,
Room 411, 332 Pine St., San Francisco, Cal. F. E. Fitzpatrick, President. Edward Fox, Secretary. November 11, 1910. $2,500.

***S. W. & B. OIL COMPANY,**
622 Merchants Exchange Bldg., San Francisco, Cal. A. D. King, Vice President. V. B. Fletcher, Assistant Secretary. March 23, 1904. $400,000. Five wells, Fresno County.

SWAN OIL COMPANY,
Visalia, Cal. A. Lewis, Vice President. H. Jerusalem, Secretary. January 8, 1900. $15,000.

SYNDICATE OIL COMPANY,
San Luis Obispo, Cal. E. W. Clark, President. P. M. Gregg, Secretary. March 18, 1905. $250,000.

SYNDICATE PETROLEUM COMPANY,
424 W. Thirty-eighth St., New York, N. Y. Care Manhattan Soap Company. Oscar M. Burke, President. E. E. Helyer, Secretary. March 26, 1912. $50,000. Kern County.

***TAMALPAIS OIL COMPANY,**
149 California St., San Francisco, Cal. E. A. Bunker, President. F. F. Bostwick, Secretary. March 31, 1910. $500,000. Three wells, Kern County.

TANNEHILL OIL COMPANY,
1815 Cherokee Ave., Hollywood, Cal. L. B. Tannehill, President. C. C. Tannehill, Secretary. February 4, 1909. $250,000. Kern County.

TAPO OIL COMPANY,
Santa Paula, Cal. S. G. Graham, President. Allan C. McKevitt, Secretary. April 27, 1900. $1,000,000.

TECUMSEH PETROLEUM COMPANY,
Spreckels Bldg., San Diego, Cal. W. H. Egan, President. A. J. Razeto, Secretary. February 2, 1918. $225,000.

***TEJON OIL COMPANY,**
P. O. Box 271, Bakersfield, Cal. H. R. Peacock, President. Peter McCart, Secretary. November 9, 1908. $20,000. One well, Kern County.

TEMPLE OIL COMPANY,
909 Title Insurance Bldg., Los Angeles, Cal. F. C. van Deinse, President. R. J. Pagen, Secretary. July 30, 1892. $60,000.

THETA OIL AND LAND COMPANY,
260 California St., San Francisco, Cal. Donald Y. Campbell, President. W. C. de Fremery, Secretary. February 20, 1900. $48,380. Kern County.

36 OIL COMPANY,
Room 3, Farmers National Bank Bldg., Fresno, Cal. December 24, 1900. $500,000.

THIRTY THIRTY TWO LAND COMPANY,
1008 Security Bldg., Los Angeles, Cal. J. M. Danziger, President. Geo. L. Reynolds, Secretary. December 8, 1910. $8,500.

32 OIL COMPANY,
836 H. W. Hellman Bldg., Los Angeles, Cal. W. C. Price, President. W. R. Wheat, Secretary. December 14, 1908. $10,000.

JOHN THOMAS OIL COMPANY,
91 Temple Block, Los Angeles, Cal. H. Clay Needham, President. James H. Blanchard, Secretary. August 6, 1900. $336,000.

THREE TWENTY OIL COMPANY,
101 Edgerly Bldg., Fresno, Cal. M. R. Maclary, Vice President. F. G. Story, Secretary. March 23, 1910. $500,000.

TIA JUANA VALLEY OIL COMPANY,
323 Timken Bldg., San Diego, Cal. September 16, 1910. $70,000.

TIBER PACIFIC OIL COMPANY,
412 Bumiller Bldg., Los Angeles, Cal. J. M. Roberts, President. A. L. Ellis, Secretary. August 5, 1914. $325,000.

TIDAL WAVE OIL COMPANY,
Care G. W. Glines, 2306 Second St., Selma, Cal. T. B. Matthews, Vice President. G. W. Glines, Secretary. July 22, 1899. $25,000.

TIGER OIL COMPANY,
614 Mills Bldg., San Francisco, Cal. Care Frank V. Bell. January 11, 1918. $10,000.

TIMBER CAÑON SYNDICATE,
Santa Paula, Cal. H. S. Williams, Manager.

TITICACA OIL COMPANY,
617 Merritt Bldg., Los Angeles, Cal. Chester W. Brown, President. F. B. Sutton Secretary. May 11, 1905. $1,000,000.

***TOPAZ OIL COMPANY,**
Box 34, Bakersfield, Cal. A. J. Woody, President. F. A. Young, Secretary. June 25, 1908. $20,000. Two wells.

TOP KNOT OIL COMPANY,
421 N. Main St., Santa Ana, Cal. A. D. Bishop President. A. J. Visel, Secretary. October 5, 1900. $200,000. Kern County.

TORREY CAÑON OIL COMPANY,
1232 Merchants Exchange Bldg., San Francisco, Cal. C. B. Wingate, President. G. M. Murphy, Secretary. July 1, 1910. $200,000.

TOWSLEY CANYON OIL COMPANY,
829 Investment Bldg., Los Angeles, Cal. J. D. Coplen, President. J. H. Borders, Secretary. July 16, 1915. $25,000.

***TRADERS OIL COMPANY,**
616 Union Oil Bldg., Los Angeles, Cal. M. V. McQuigg, President. A. J. Wallace, Secretary. July 13, 1907. $1,500,000. Twenty-five wells, Fresno County; 27 wells, Kern County.

***TRAFFIC OIL COMPANY,**
616 Union Oil Bldg., Los Angeles, Cal. M. V. McQuigg, President. A. J. Wallace, Secretary. April 12, 1910. $2,500,000. Fourteen wells, Kern County.

TRES SIERRITAS OIL AND MINING COMPANY,
P. O. Box 505, Lemoore, Cal. John H. McGlashan, President. Edw. P. Ammerman, Secretary. October 21, 1899. $60,000.

TRI-STATE OIL COMPANY,
La Habra, Cal. F. G. Philipps, President. E. B. Coil, Secretary. March 13, 1912. $500,000.

***TROJAN OIL COMPANY,**
401 Union Oil Bldg., Los Angeles, Cal. A. J. Aber, President. B. M. Howe, Secretary. May 19, 1914. $500,000. One well, Kern County.

TRUE OIL COMPANY, THE,
714 Story Bldg., Los Angeles Cal. Frank H. True, President. E. E. Prime, Secretary. February 23, 1917. $2,000,000.

TULARE OIL AND MINING COMPANY,
115 N. K St., Tulare, Cal. L. E. Schoenemann, President. C. W. Cobb, Secretary. November 1, 1890. $300,000. Kern County.

***TUMBADOR OIL COMPANY,**
1112 Merchants National Bank Bldg., San Francisco, Cal. W. F. Williamson, President. E. M. Eddy, Secretary. May 5, 1910. $500,000. Seven wells, Kern County.

TUNNEL PETROLEUM COMPANY,
906 S. Hill St., Los Angeles, Cal. F. R. Campbell, President. H. A. Dunn, Secretary. April 28, 1916. $250,000.

TURNER OIL COMPANY (Los Angeles),
2474 E. Ninth St., Los Angeles, Cal. G. L. Holton, President. Robt. G. Holton, Secretary. June 14, 1899. $150,000.

TURNER OIL COMPANY (San Francisco),
180 Sutter St., San Francisco, Cal. Joseph Seeley, President. J. W. Pauson, Secretary. November 5, 1904. $50,000. Fresno County.

***T. W. COMPANY,**
Box 34, Bakersfield, Cal. T. M. Young, President. G. R. Peckham, Secretary. March 12, 1909. $100,000. Five wells, Kern County.

TWENTIETH CENTURY OIL COMPANY,
1927 Mariposa St., Fresno, Cal. A. V. Lesenby, President. W. O. Miles, Secretary. October 25, 1900. $200,000.

TWENTY-FOUR OIL COMPANY,
1017 J St., Fresno, Cal. Geo. Kaehler, President. A. C. Ruschbaupt, Secretary. December 1, 1909. $24,000.

TWIN CITIES OIL COMPANY,
Broad St., Nevada City, Cal. C. E. Clinch, President. D. E. Morgan, Secretary. May 20, 1901. $250,000.

UNION ANNEX OIL COMPANY,
1210 Washington Bldg., Los Angeles, Cal. J. S. Torrance, President. February 24, 1903. $1,000,000.

UNION KERN OIL COMPANY,
545 I. W. Hellman Bldg., Los Angeles, Cal. July 30, 1910. $1,000,000.

***UNION OIL COMPANY OF CALIFORNIA,**
1114 Union Oil Bldg., Los Angeles, Cal. W. L. Stewart, President. John McPeak, Secretary. October 17, 1890. $5,000,000, Orig.; $50,000,000, Inc. Eighteen wells, Fresno County; 18 wells, Kern County; 65 wells, Orange County; 84 wells, Ventura County; 102 wells, Santa Barbara County.

***UNITED CRUDE OIL COMPANY, THE,**
P. O. Box 561, Maricopa, Cal. E. H. Loveland, President. August 16, 1908. $500,000. Four wells, Kern County.

UNITED DEVELOPMENT COMPANY,
193 E. E St., Coalinga, Cal. O. D. Loftus, President. Guy H. Salisbury, Secretary. September 21, 1909. $45,000.

UNITED MIDWAY OIL COMPANY,
Box 337, Visalia, Cal. J. C. Newman, President. C. E. Groat, Secretary. March 5, 1910. $100,000. Kern County.

***UNITED OIL COMPANY, THE,**
1131 Investment Bldg., Los Angeles, Cal. C. F. Whittier, President. K. E. Steinbauer, Secretary. November 19, 1909. $2,000,000. Ten wells, Kern County.

UNITED PETROLEUM COMPANY,
1114 Union Oil Bldg., Los Angeles, Cal. Lyman Stewart, President. John McPeak, Secretary. (Dissolved.)

U. S. OIL AND MINING COMPANY,
Box 246, Bakersfield, Cal. Martin Coyne, President. L. Hirshfeld, Secretary. December 23, 1899. $300,000. Kern County.

U. S. OIL REFINING AND PRODUCTION COMPANY,
316 Hobart Bldg., San Francisco, Cal. J. C. Kemp van Ee, President. P. F. Unger, Secretary. January 27, 1910. $1,000,000.

UNITED WESTERN CONSOLIDATED OIL COMPANY,
Hobart Bldg., San Francisco, Cal. A. G. Wilkes, President. Fred Shingle, Secretary. May 1, 1917. $3,000,000.

***UNITED WESTERN OIL COMPANY,**
705 Hobart Bldg., San Francisco, Cal. John McKeon, President. A. B. Kast, Secretary. April 12, 1916. $500,000. One well, Kern County.

***UNIVERSAL OIL COMPANY,**
510 Crocker Bldg., San Francisco, Cal. R. N. Bishop, President. R. A. Morton, Secretary. April 27, 1911. $6,000,000. Twenty-four wells, Kern County.

VALLEY OIL COMPANY,
Care J. A. Fleutsch, Coalinga, Cal. S. W. Morshead, President. J. A. Fleutsch, Secretary. February 18, 1909. $100,000.

VANCOUVER MIDWAY OIL COMPANY,
310 Sansome St., San Francisco, Cal. A. L. Weil, President. M. Syme, Secretary. January 10, 1911. $100,000. Kern County.

VANDERLIP OIL COMPANY,
114 E. Fourth St., Santa Ana, Cal. Geo. A. Edgar, President. H. C. Vanderlip, Secretary. February 16, 1901. $200,000. Kern County.

VENTURA OIL LANDS COMPANY,
433 California St., San Francisco, Cal. R. K. Barrows, President. A. E. Boynton, Secretary. (Dissolved.)

***VENTURA PACIFIC OIL COMPANY,**
412 Owl Drug Bldg., San Diego, Cal. F. E. Wisecup, President. E. G. Dehm, Secretary. October 18, 1912. $225,000. Five wells, Ventura County.

VERA CRUZ OIL COMPANY,
1101 Story Bldg., Los Angeles, Cal. Wm. Perry, President. C. A. Goodrich, Secretary. November 19, 1915. $100,000.

VERATINA OIL COMPANY,
348 Hayes St., San Francisco, Cal. A. W. Craig, Secretary. February 27, 1901. $150,000.

***VESTA OIL COMPANY,**
409 Consolidated Realty Bldg., Los Angeles, Cal. Geo. F. Freeman, President. L. Schenck, Secretary. August 7, 1900. $300,000. Eleven wells, Kern County.

***VICTOR OIL COMPANY,**
1109 I. N. Van Nuys Bldg., Los Angeles, Cal. H. D. Colson, President. Frank C. Winter, Secretary. March 30, 1910. $500,000. Four wells, Kern County.

VICTORIA OIL COMPANY,
605 Van Nuys Bldg., Los Angeles, Cal. Charles Murray, President. E. J. Murray, Secretary. November 30, 1914. $50,000.

***VIRGINIA OIL COMPANY,**
Box 655, Los Angeles, Cal. John M. Sands, President. J. B. Kessinger, Secretary. May 26, 1914. $25,000. Twenty-seven wells, Kern County.

***VISALIA MIDWAY OIL COMPANY,**
110 S. Court St., Visalia, Cal. E. L. Smith, President. Geo. D. Smith, Secretary. March 9, 1901. $500,000. Four wells, Kern County.

VISALIA OIL COMPANY,
626 S. Garden St., Visalia, Cal. Louis Lucier, President. Otto Luhdorff, Secretary. April 13, 1914. $100,000. Kern County.

VISHNU OIL COMPANY,
300 Crocker Bldg., San Francisco, Cal. W. Gregg, Jr., President. W. R. Berry, Secretary. June 20, 1900. $500,000.

***VOLCAN OIL AND REFINING COMPANY,**
First and I Sts., P. O. Box 83, San Diego, Cal. C. H. Wagner, President. G. F. Nolan, Secretary. January 24, 1902. $550,000. Seven wells, Kern County.

WABASH OIL COMPANY,
310 Sansome St., San Francisco, Cal. John Barneson, President. W. J. Dinsmore, Secretary. April 14, 1903. $300,000, Orig.; $15,000, Dec.

WALKER OIL COMPANY,
305 Fifth St., Coalinga, Cal. November 1, 1909. $300,000.

***W. AND S. OIL COMPANY,**
1112 Merchants National Bank Bldg., San Francisco, Cal. W. F. Williamson, President. D. E. Gunn, Secretary. May 19, 1911. $200,000. Four wells, Kern County. (Property leased to Potter Oil Company of California, September, 1917.)

***WARD OIL COMPANY,**
Room 3, Farmers National Bank Bldg., Fresno, Cal. Geo. L. Warlow, President. Chester H. Warlow, Secretary. November 15, 1907. $100,000. Eight wells, Fresno County.

WASHINGTON COALINGA OIL COMPANY,
Care Harry Dalton, 601 Foster Bldg., Denver, Col. Fresno County.

***WATSONVILLE OIL COMPANY,**
339 Main St., Watsonville, Cal. M. B. Tuttle, President. A. W. Cox, Secretary. December 15, 1896. $100,000, Orig.; $200,000, Dec. Four wells, Santa Clara County.

WELCH, P.,
Maricopa, Cal.

WELCOME OIL COMPANY,
78 Bacon Bldg., Oakland, Cal. J. J. Enos, President. Frank Rogers, Secretary. October 14, 1909. $200,000.

***WENONAH OIL COMPANY,**
1112 Merchants National Bank Bldg., San Francisco, Cal. W. F. Williamson, President. E. M. Eddy, Secretary. March 15, 1911. $650,000. Six wells, Kern County. (Property sold to Tumbador Oil Company.)

WESCO PETROLEUM COMPANY,
502 Merritt Bldg., Los Angeles, Cal. D. J. Gouyer, President. Kern County.

WEST AMERICAN OIL COMPANY,
Care S. W. Waterhouse, 474 N. First St., San Jose, Cal. S. W. Waterhouse, President. Annie C. Waterhouse, Secretary. September 2, 1914. $25,000.

***WEST COAST OIL COMPANY,**
55 New Montgomery St., San Francisco, Cal. Wm. Sproule, President. P. G. Williams, Secretary. June 23, 1908. $5,000,000. Ten wells, Los Angeles County; 48 wells, Orange County.

WESTERN MINERALS COMPANY,
704 West Coast Life Bldg., 354 Pine St., San Francisco, Cal. H. L. Tevis, President. F. G. Drum, Secretary. December 14, 1899. $100,000.

WESTERN OIL AND GAS COMPANY, LTD.,
511 Hutton Bldg., Spokane, Wash. Jno. M. Downs, President. L. M. Weaver, Secretary. February 14, 1917. $150,000.

WESTERN OIL COMPANY,
1031 Black Bldg., Los Angeles, Cal. F. P. W. Hill, President. G. Zeeman, Secretary. April 15, 1912. $10,000.

***WESTERN UNION OIL COMPANY,**
402 Bradbury Bldg., Los Angeles, Cal. C. P. Bagg, President. Morris Albee, Secretary. April 19, 1900. $1,000,000. Forty wells, Santa Barbara County.

***WEST HUASNA OIL COMPANY,**
Orcutt, Cal. J. F. Forbes, President. A. Mailloux, Secretary. Two wells, Ventura County. (Dissolved.)

WEST PENN COMPANY, INC., THE,
Brower Bldg., Bakersfield, Cal. F. L. Bartlett, President. F. L. Stowell, Secretary.

***WEST SIDE OIL COMPANY,**
608 Grosse Bldg., Los Angeles, Cal. Geo. W. Walker, President. Lester L. Robinson, Secretary. December 7, 1908. $100,000. Three wells, Kern County.

WEST SLOPE OIL COMPANY,
300 E. Main St., Visalia, Cal. C. J. Giddings, President. J. Sub Johnson, Secretary. June 1, 1911. $1,000,000.

WEST STATES PETROLEUM COMPANY,
Hobart Bldg., San Francisco, Cal. April 17, 1917. $1,000,000. (Property sold to United Western Consolidated Oil Company.)

WHITE ROCK PETROLEUM COMPANY,
1386 Seventh Ave., San Francisco, Cal. W. I. Sterett, President. A. A. Cohn, Secretary. November 18, 1911. $300,000.

***WHITE STAR OIL COMPANY,**
510 Trust and Savings Bldg., Los Angeles, Cal. Richard Arenz, President. Chas. E. Putnam, Secretary. February 8, 1909. $1,000,000. Eight wells, Ventura County.

WHITTIER CONSOLIDATED OIL COMPANY,
1004 Security Bldg., Los Angeles, Cal. Thos. A. O'Donnell President. Ellis T. Yarnell, Secretary. June 7, 1900. $1,000,000.

WHITTIER CRUDE OIL COMPANY,
200 S. Los Angeles St., Los Angeles, Cal. L. D. Sale, President. H. G. A. Lovell, Secretary. January 22, 1900. $300,000. Seven wells, Los Angeles County.

WHITTIER OIL AND DEVELOPMENT COMPANY,
104 W. Philadelphia St., Whittier, Cal. C. W. Clayton, President. S. W. Barton, Secretary. May 31, 1900. $250,000.

***WILBERT OIL COMPANY, THE**
1704 Nineteenth St., Bakersfield, Cal. H. A. Jastro, President. F. G. Munzer, Secretary. September 18, 1907. $125,000. Eight wells, Kern County.

WILCOX OIL COMPANY,
Room 637, 58 Sutter St., San Francisco, Cal. Chas. G. Wilcox, President. A. N. Baldwin, Secretary. February 21, 1911. $1,000,000.

WILKES HEAD OIL COMPANY,
705 Hobart Bldg., San Francisco, Cal. Thomas Wilkes, President. A. B. Kast, Secretary. November 3, 1913. $300,000.

***H. S. WILLIAMS OIL COMPANY,**
112 Market St., San Francisco, Cal. H. S. Williams, President. John Lee, Jr., Secretary. March 30, 1916. $25,000. Two wells, Kern County.

WILSHIRE OIL COMPANY,
417 Higgins Bldg., Los Angeles, Cal. Care A. P. Michael Harlain. August 30, 1917. $250,000.

W. J. OIL ÇOMPANY,
Care E. F. Coons, Bakersfield, Cal. S. P. Wible, President. Edith F. Coons, Secretary. October 23, 1908. $25,000. Kern County.

W. K. OIL COMPANY,
180 Sutter St., San Francisco, Cal. John Hinkel, President. J. W. Pauson, Secretary. December 8, 1904. $25,000. Fresno County.

***W. M. AND M. OIL COMPANY, THE,**
Box 501, Fresno, Cal. M. L. Woy, President. D. C. Sample, Secretary. November 17, 1909. $100,000. Four wells, Fresno County.

***W. T. & M. COMPANY,**
Box 34, Bakersfield, Cal. T. M. Young, President. G. R. Peckham, Secretary. April 19, 1909. $500,000. Six wells, Kern County.

WYOMING CONSOLIDATED OIL COMPANY,
620 N. Marengo Ave., Pasadena, Cal. C. W. Leighton, President. A. L. Twombly, Secretary. July 18, 1912. $3,000,000.

YELLOW CREEK EXPLORATION COMPANY,
Merchants National Bank Bldg., San Francisco, Cal. Care W. F. Williamson. November 22, 1917. $25,000.

YELLOWSTONE OIL COMPANY,
711 Merchants National Bank Bldg., Los Angeles, Cal. J. H. Collier, President. Ira L. Vance, Secretary. July 10, 1907. $1,000,000. Kern County.

YORBA OIL COMPANY,
1004 Title Insurance Bldg., Los Angeles, Cal. C. L. Wallis, President. J. E. Wallis, Secretary. May 29, 1914. $75,000.

***YORK COALINGA OIL COMPANY,**
607 First National Bank Bldg., San Francisco, Cal. Robert Hays Smith, President. F. M. Bortner, Secretary. April 30, 1902. $300,000. Three wells, Fresno County.

YOSEMITE OIL COMPANY,
414 Oakland Bank Bldg., Oakland, Cal. W. E. Beck, President. O. E. Hotchkiss, Secretary. October 7, 1899. $200,000 Orig.; $10,000, Dec.

***ZENITH OIL COMPANY,**
428-9 I. W. Hellman Bldg., Los Angeles, Cal. Edward Strasburg, President. A. F. Schiffman, Secretary. April 20, 1900. $30,000. Two wells, Los Angeles County.

***ZIER OIL COMPANY,**
1002 Crocker Bldg., San Francisco, Cal. Wm. L. McGuire, President. C. H. Holbrook, Jr., Secretary. April 5, 1905. $100,000. Fourteen wells, Fresno County.

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BULLETIN No. 81

THIRD ANNUAL REPORT

OF THE

State Oil and Gas Supervisor of California

FOR THE FISCAL YEAR 1917-1918

Covering Operations of the Department of Petroleum and Gas of the State Mining Bureau

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Submitted to

FLETCHER HAMILTON, State Mineralogist

by

R. P. McLAUGHLIN, State Oil and Gas Supervisor

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LETTERS OF TRANSMITTAL.

December 1, 1918.

To His Excellency, the HONORABLE WILLIAM D. STEPHENS,
Governor of California.

SIR: I have the honor to transmit herewith Bulletin No. 84 of the State Mining Bureau, being the Third Annual Report of the State Oil and Gas Supervisor.

The law providing for the protection of California oil deposits against water and other damage following improper development methods is an outgrowth of local conditions, and had little or no precedent to follow.

The underlying motive is to gather and arrange facts as to underground conditions and supervise oil field operations, as far as possible, in an advisory manner.

Previous to the enactment of this law, but scant attention had been given to the gathering and comparing of facts, and operations were largely conducted upon theories as to underground conditions. As the theories were usually advanced by men of long experience, the ordinary usage assumed the misnomer of "practical methods."

Very gratifying results have followed three years of educational work, during which time both the department and the oil operators have advanced in knowledge of natural laws governing underground conditions.

As was to be expected in such work, a few operators have not readily adopted suggested changes in operations, and some do not yet realize their responsibility in protecting the oil fields, in which the public is vitally interested. Some changes in the law, therefore, will be necessary in order to make it thoroughly effective. Such changes will not affect individuals or corporations who are more interested in the spirit rather than the letter of the law.

Respectfully submitted.

FLETCHER HAMILTON,
State Mineralogist.

MR. FLETCHER HAMILTON,
State Mineralogist.

SIR: In transmitting the Third Annual Report of the work of the Department of Petroleum and Gas, I believe it may be well to call attention to the fact that the usefulness of the department to the public requires absolute impartiality in dealing with the various producers, both large and small. It is a pleasure to record that the department has been given a free hand to discharge its duty.

Respectfully submitted.

R. P. MCLAUGHLIN,
State Oil and Gas Supervisor.

CHAPTER I.

By R. P. McLAUGHLIN, State Oil and Gas Supervisor.

The war has more clearly than ever demonstrated that our national existence demands economy in almost all forms of material and energy. The burden resting upon the petroleum industry does not simply end with the production of more oil; it is equally important that labor and drilling material shall not be uselessly dissipated during the course of production. Furthermore, it is particularly important that the natural underground reservoirs of oil shall not be mutilated and rendered inaccessible through over-hasty and ill-considered drilling. All these necessities will maintain even though peace has been achieved.

In order to fully meet these demands, it is a self-evident fact that the most careful and painstaking study must guide operations, and advantage must be taken of all past experiences. Such an orderly and logical utilization of facts is herein referred to as ''scientific management'' or ''engineering methods.''

Clear recognition must be had of the distinction between the hazard of ''wildcat'' operations and operations in proved fields. The hazard in the latter is comparatively small, and it is possible to apply many rules and precedents.

The State Mining Bureau has, for several years, specially directed its efforts to the encouragement of efficient or scientific oil field development. The law authorizing the Department of Petroleum and Gas is built around and rests primarily upon the idea of applying scientific methods and discoveries.

When the department was organized, its first efforts were directed to inquiries determining to what extent modern principles of management were already being utilized by oil producers. It was found that several concerns were so organized and conducted. The details of such organizations were related in our Second Annual Report[1]. It is gratifying to note that, in direct response to our suggestions, the number of concerns operating by means of scientific methods has been at least doubled.

Public opinion eventually controls the methods of all important lines of business and industry. It may, therefore, be well to point out in passing, that three large oil concerns have not yet adopted modern, scientific methods of directing their drilling work, namely: Standard Oil Company[2], Union Oil Company of California[3], and a portion of the so-called Doheny interests[4].

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[1] Bull. 82, Cal. State Min. Bur. pp. 9, 10.
[2] See pp. 239 to 272.
[3] See pp. 413 to 450.
[4] See pp. 59 to 72, and p. 208, *post*.

Public interest requires further legislation to compel proper operations by such concerns as are not receptive to educational methods of legal administration and still fail to recognize their obligations in the matter of protecting the oil deposits of California.

In our previous reports[1], considerable attention was devoted to explaining and illustrating the elementary features upon which thorough development and protection of the oil fields rest. The present report omits the elementary principles and merely recites the actual work and developments of the past year. Such new principles as we have been able to thoroughly study are also described.

It should be particularly noted that a complete list of all operations upon which the department has passed is given in this and previous reports. The facts thus recorded will be found useful to careful investigators.

The policy of issuing recommendations to operators, rather than orders, has been continued. This provides elasticity in the system of supervising oil field operations, so that facts or conditions, subsequently discovered, can be informally presented by an operator and a supplementary recommendation issued. The greater portion of our work is carried on informally by consultation between field representatives of the department and the operators. The written records, however, cover all proposals and recommendations. It was necessary to issue only three formal orders:

ORDER No. 4, relative to State Consolidated Oil Company, Lloyd well No. 2.[2]

ORDER No. 5, relative to Union Oil Company, International well No. 7.[3]

ORDER No. 6, relative to Petroleum Midway Company, Ltd., Darlington well No. 1.[4]

There were, however, many instances in which the department did not approve operations, and the written records have merely been kept clear and complete so as to provide for such future legal action as may be necessary. Some of the operations which were not approved may never cause serious damage, and it is believed that ultimately more good will be accomplished by the past liberal or educational administration of the law than by drastic legal action. Formal orders, in general, have been issued on the following grounds:

(1) At the request of the operator;

(2) Where great and immediate damage seemed probable;

(3) Where it appeared that the operator was defiant of legal restrictions.

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[1] Bull. 73 and 82, Cal. State Min. Bur.

[2] Bull. 82, Cal. State Min. Bur. pp. 193-4.

[3] See pp. 413 to 450, *post*.

[4] See p. 213, *post*.

Legal action was taken in two instances[1] only, namely: against Thomas A. Slocum; and against I. W. Fuqua, as president, general manager and agent of the Red Star Petroleum Company.

The first action was taken on account of repeated failure to file records and was dismissed when the records were produced. The second action was taken where it appeared that deliberate attempts were being made to conceal information obtained during drilling operations. Conviction was not obtained. A change in the statutory provisions governing the department in such matters is necessary.

A marked improvement in field operations has taken place throughout the state since the enactment of the law, and more care is given by operators to the details necessary to the proper drilling of wells. On the other hand, attention is called to the fact that improvement has not been so widespread that legal supervision is no longer needed. Two new fields (Montebello and Casmalia), developed in the past two years, have already encountered water in menacing quantities. These fields are in the hands of large operators, and the difficulties follow directly upon their failure to co-operate with the department in the matter of careful engineering study and control. As has been repeatedly stated, the department has neither the facilities nor the inclination to originate plans directing, in detail, the operations of any concern. Proposed operations, particularly those of great volume, should be accompanied by carefully compiled data, supporting a well-considered plan. The concerns above mentioned have greatly retarded and discredited the administration of the law by attempting to shift upon the department the burden of planning operations.

Maps of all the oil fields have been completed and are on sale at our various offices at prices which merely cover the cost of blue printing. These maps are revised from time to time to show the latest developments. Such information has not, heretofore, been readily available to the public.

Models showing the geological and mechanical conditions have been constructed[2] and displayed at our various field offices. The number of persons calling for the purpose of inspecting these models, particularly at our Los Angeles office, indicates that the models are useful to the public, besides being necessary in the work of the department.

Office buildings were constructed at Coalinga and Taft, which have facilitated our work during the latter part of the year. The building at Taft will have to be enlarged in order to display models, which can now be rapidly assembled and made available for public use.

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[1] The People of the State of California v. Thomas A. Slocum, p. 315. The People of the State of California v. I. W. Fuqua, pp. 208 to 211, *post*.

[2] Bull. No. 82, Cal. State Min. Bur. p. 64.

Several public meetings were held for the purpose of discussing details of certain field operations. A meeting at Los Angeles[1], for the purpose of considering the use of mud fluid, was well attended, and several interesting, detailed papers were presented, and served as a basis for discussion. However, subsequent field operations demonstrated that the suggestions were not acted upon. A meeting at San Francisco, for the purpose of discussing the subject of proper and economical spacing of wells[2], brought out but little definite information beyond that compiled by the department[3]. Several large concerns were not represented by engineers or others who were prepared to present detailed evidence that the subject had been seriously considered.

While the subject of the most economical spacing of wells might, at first glance, appear to be abstract and theoretical, it will be found that systematic observations, governed by common sense, will afford valuable information. It has long been recognized that wells drain territory for varying distances[4], and it is self-evident that, if wells are too closely spaced, some of them are merely a waste of labor and material.

The department has made no extended or systematic investigation of the subject, but it has observed some striking instances. One of the best examples coming to our attention is shown by the accompanying diagram (Fig. 1), which shows the production of four wells over a period of nearly four years. It will be noted that, as each new well was completed there was a marked decline in productions of wells already producing. The new well drew much of its production from areas previously supplying adjoining wells. As a matter of fact, one well, or at the utmost two, would have produced as much oil.

The article by E. A. Starke (pp. 107 to 109, *post*), describing a process for the increased utilization of heavy oil, should be of particular interest to many producers. The policy of publishing original articles of public interest was established in our previous reports[5].

Needless expense in oil field operations has repeatedly been mentioned in reports of this department. The special report by R. E. Collom, comparing results obtained from various methods of shutting off water, furnishes data which can be used to reduce present losses to an amount at least equal to the total expenditures by this department.

There has been a disposition, in some quarters, to belittle or discount previous statements as to inefficiency. It would appear unnecessary to do more than merely point out the results obtained by various large producers, as shown in the following table. It will be noted that the per-

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[1] Pp. 77 to 106, *post*. Demonstrations of use of Mud-Laden Fluid in Oil Well Operations.

[2] Bull. No. 73, Cal. State Min. Bur. pp. 134 to 140.

[3] Diagram of International Wells. P. 11, *post*.

[4] Bull. No. 69, Cal. State Min. Bur. pp. 58–59.

[5] Bull. No. 73, Cal. State Min. Bur. pp. 228–233. Bull. No. 82, Cal. State Min. Bur. p. 81.

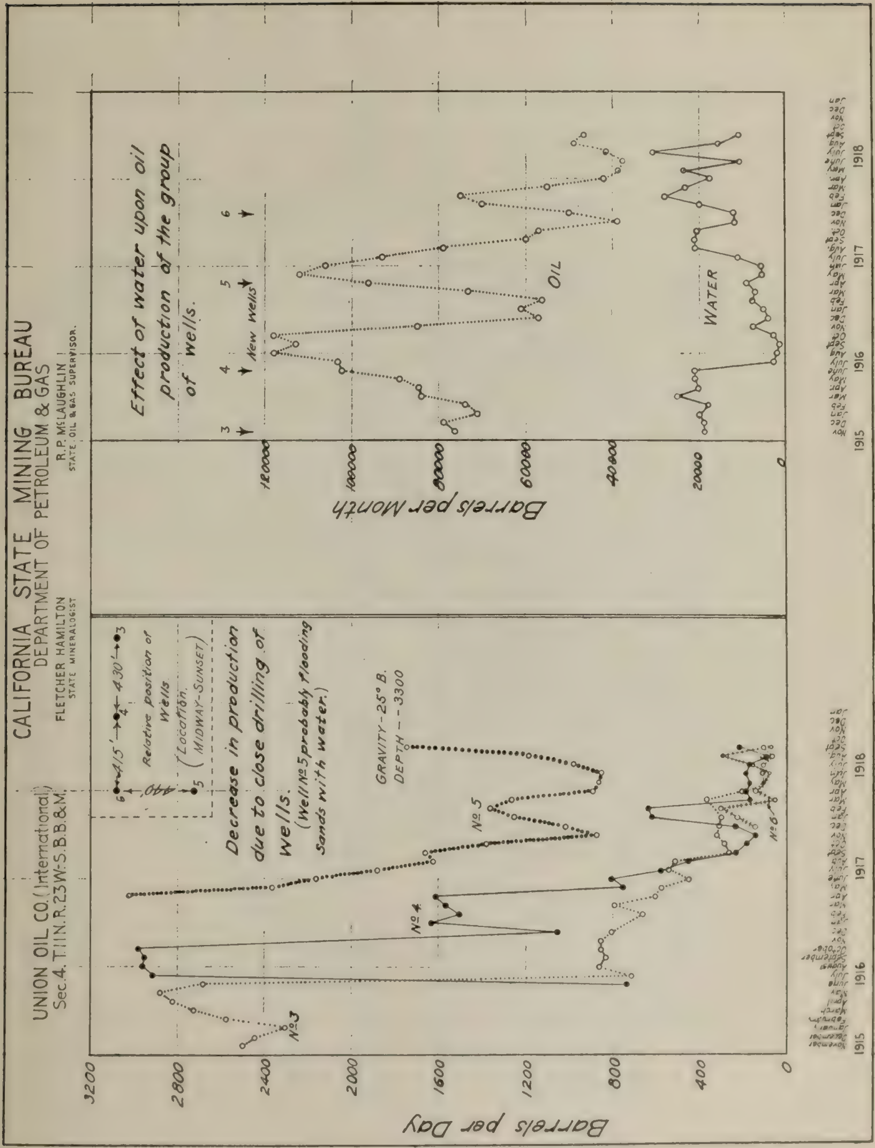

FIG. 1.

centage of successful work ranges from 93 down to 71. The largest producer in the state shuts off water successfully at less than three wells out of every four, while, on the other hand, the average of successful shut-offs among small operators is slightly better than nine out of ten.

Particular attention is called to the current statement that "efficient oil operations require that the industry be in the hands of large concerns."

TABLE I.

Comparison of Results Obtained by Certain Companies in Excluding Water From Oil Wells in California.

July 1, 1917-June 30, 1918.

Counties	Associated			Doheny			General Petroleum			Southern Pacific			Standard		
	Shut-off success	Shut-off failure	Per cent of success	Shut-off success	Shut-off failure	Per cent of success	Shut-off success	Shut-off failure	Per cent of success	Shut-off success	Shut-off failure	Per cent of success	Shut-off success	Shut-off failure	Per cent of success
Los Angeles and Orange	8		100	6	5	55							38	25	60
Ventura				9	3	75									
Santa Barbara	29	4	88	28	4	87							2		100
Kern	13	3	81	4		100	49	11	82	59	19	76	52	16	77
Fresno	13	4	76	7		100				26	7	79	13	2	87
Totals	63	11	**85**	54	12	**82**	49	11	**82**	85	26	**77**	105	43	**71**

Comparison of Results Obtained by Certain Companies in Excluding Water From Oil Wells in California—Continued.

Counties	Union			Santa Fe			Honolulu			Shell			Total		
	Shut-off success	Shut-off failure	Per cent of success	Shut-off success	Shut-off failure	Per cent of success	Shut-off success	Shut-off failure	Per cent of success	Shut-off success	Shut-off failure	Per cent of success	Shut-off success	Shut-off failure	Per cent of success
Los Angeles and Orange	15	4	79	6	1	86							73	35	67
Ventura										†2		100	11	3	79
Santa Barbara	20	2	91							3		100	82	10	89
Kern	9	6	60	37	6	86	3		100				226	61	79
Fresno	2	1	66							50	4	93	111	18	86
Totals	46	13	**78**	43	7	**86**	3		**100**	55	4	**93**	503	127	**80**
All other operators													197	19	**91**
Grand totals*													700	146	**83**

*Does not include 25 recementing jobs, 22 of which were failures.

†Both jobs successful at test, but failed shortly afterwards.

Immediately upon the organization of the department, we were requested to make definite rules regulating the use of rotary tools. Stringent rules were not adopted because it appeared no definite evidence had been collected by the supporters of either the rotary or cable tools. It was also apparent that many claimants were unduly prejudiced in favor of one method or the other. The figures now available show that failures to shut off water occur very much oftener with rotary tools than with cable tools.

The extraordinary difficulty in properly drilling and protecting the Sunset field was pointed out in formal order No. 5, relative to Union Oil Company well No. 7, International. This order was held by some individuals to be too stringent. Attention is now called to the fact that only one-half of the attempts made in the Sunset field to shut off water in rotary holes are successful.

In the case where the department took legal action, charging falsification of drilling records, the future of the very productive Montebello field was at stake. The figures at hand now show that more than a third of the attempts to shut off water are failures. Therefore the department has no apologies to offer for exhausting all legal methods in attempting to protect this field.

Both the advantages of careful engineering work and the disadvantage of rotary tools are clearly set forth by the figures showing the percentage of failures in the Coalinga field. It will be noted that the difference between the success and failure of a shut-off frequently depends upon determining, within five feet, the depth at which a shut-off should be attempted. This can not be determined without geological and engineering work, and requires a log more accurate than can be obtained when rotary tools are used.

The department has frequently been called upon to make definite blanket rulings requiring the use of cement at all wells. We have avoided taking such a position on account of the lack of definite facts. It is, therefore, of special interest to note that a comparison of results shows that cement is not always necessary. In other words, the mere use of cement is not automatically a cure or preventative for all water troubles.

Some operators have argued that the use of large quantities of cement would protect all oil formations left back of a string of casing. This argument has been advanced particularly by some of the concerns having poor records for simple shut-off at the shoe of casing. Therefore, the burden of proof remains upon them.

There are several cementing concerns who do work by contract. Their varying percentage of success is shown by the figures.

There are numerous mechanical details which must be given careful attention if successful shut-offs are to be obtained. Sometimes operators have indicated that the department is too strict. Such opinions are usually held by persons who have not had wide experience in observing such work, and the details set forth by Mr. Collom will show the careful reader that there is a basis of fact for our requirements.

STATISTICS OF OIL PRODUCTION.

Monthly statistics for various fields and for the entire state are given here for the purpose of bringing records, previously published in Bulletins Nos. 69, 73 and 82, down to date. The figures as in previous publications, are those collected by the Standard Oil Company. They closely check those collected by the Independent Oil Producers' Agency and also the figures collected by this department in the form of sworn statements.

The Lost Hills and Belridge fields show the greatest decline in average daily production per well. All fields, except Lompoc and Santa Maria and Whittier-Fullerton, show a decline in production. It has already been noted that the increases for the Lompoc and Santa Maria field and the Whittier-Fullerton field are due, respectively, to the Casmalia and Montebello fields.

KERN RIVER.

	Number of wells		Average daily production in barrels	
	Producing	Completed	Total	Per well
1917—July	1,914	3	22,945	11.8
August	1,935	1	23,220	12.0
September	1,959	3	22,835	11.7
October	1,964	1	22,555	11.5
November	1,966	5	22,510	11.4
December	1,969	2	22,325	11.3
1918—January	1,975	------------	21,855	11.1
February	1,975	2	21,985	11.1
March	1,970	2	22,300	11.3
April	1,966	1	22,450	11.4
May	1,970	3	22,244	11.3
June	1,917	3	21,504	11.2

McKITTRICK.

	Number of wells		Average daily production in barrels	
	Producing	Completed	Total	Per well
1917—July	305	4	8,897	29.2
August	307	3	9,048	29.5
September	309	1	8,482	27.4
October	311	2	8,213	26.4
November	312	1	8,485	27.2
December	309	2	8,673	28.1
1918—January	314	2	8,661	27.6
February	317	1	8,314	26.2
March	309	3	8,302	26.9
April	316	3	8,356	26.4
May	321	------------	8,146	25.4
June	303	3	8,651	28.6

MIDWAY-SUNSET.

	Number of wells		Average daily production in barrels	
	Producing	Completed	Total	Per well
1917—July	1,865	25	99,349	53.2
August	1,898	24	105,064	55.4
September	1,923	29	100,260	52.0
October	1.956	19	98,740	50.5
November	1,982	21	97,266	49.0
December	1,997	19	96,947	48.5
1918—January	2,014	31	97,606	48.5
February	2,046	22	97,962	47.9
March	2,065	18	95,334	46.1
April	2,085	14	97,010	46.5
May	2,094	18	97,916	44.4
June	2,114	17	94,048	44.5

LOST HILLS AND BELRIDGE.

	Number of wells		Average daily production in barrels	
	Producing	Completed	Total	Per well
1917—July	428	14	18,412	43.0
August	445	12	18,172	40.8
September	456	8	18,428	40.4
October	463	11	17,947	38.8
November	473	10	17,345	36.7
December	485	7	17,373	35.8
1918—January	491	3	16,973	34.5
February	491	5	15,841	32.2
March	496	2	15,709	31.6
April	498	6	15,687	31.4
May	507	6	14,867	29.3
June	503	2	14,251	28.4

COALINGA.

	Number of wells		Average daily production in barrels	
	Producing	Completed	Total	Per well
1917—July	1,005	13	42,930	42.7
August	1,018	12	42,962	42.2
September	1,034	9	43,945	42.5
October	1,031	12	43,449	42.1
November	1,048	11	44,007	42.0
December	1,038	16	44,925	43.2
1918—January	1,063	8	46,060	43.3
February	1,068	4	45,086	42.3
March	1,064	8	43,963	41.2
April	1,067	7	45,671	42.8
May	1,075	9	45,125	42.0
June	1,130	12	44,842	39.7

LOMPOC AND SANTA MARIA.

	Number of wells		Average daily production in barrels	
	Producing	Completed	Total	Per well
1917 July	263	8	15,544	59.1
August	269	7	15,965	59.3
September	278	9	16,680	60.0
October	285	6	17,870	62.7
November	291	6	17,765	61.0
December	300	5	20,340	67.8
1918 January	309	6	18,545	60.0
February	309	7	19,775	64.0
March	313	8	17,913	57.3
April	328	5	21,355	65.1
May	331	----------	19,577	59.1
June	334	2	20,549	61.5

VENTURA-NEWHALL.

	Number of wells		Average daily production in barrels	
	Producing	Completed	Total	Per well
1917—July	473	1	3,484	7.4
August	467	2	3,387	7.3
September	461	2	3,623	7.9
October	452	1	3,674	8.1
November	445	1	3,348	7.5
December	451	1	3,234	7.2
1918—January	447	4	3,073	6.9
February	463	3	3,020	6.5
March	462	4	3,277	7.1
April	467	4	3,173	6.8
May	471	4	3,325	7.0
June	463	3	3,754	8.1

LOS ANGELES AND SALT LAKE.

	Number of wells		Average daily production in barrels	
	Producing	Completed	Total	Per well
1917—July	670	----------	3,990	6.0
August	662	----------	3,920	5.9
September	662	----------	4,198	6.3
October	662	----------	4,100	6.2
November	665	1	3,993	6.0
December	683	----------	4,038	5.9
1918—January	662	----------	3,962	6.0
February	662	----------	3,822	5.8
March	661	----------	3,923	5.9
April	661	----------	3,825	5.9
May	661	----------	3,853	5.8
June	667	----------	3,471	5.2

WHITTIER-FULLERTON.

	Number of wells		Average daily production in barrels	
	Producing	Completed	Total	Per well
1917—July	679	6	42,485	64.0
August	683	7	49,787	73.0
September	693	5	55,954	80.7
October	693	4	54,533	78.8
November	699	7	55,457	79.3
December	704	3	55,251	78.5
1918—January	703	8	54,024	77.0
February	710	7	56,632	79.9
March	713	6	56,778	79.7
April	713	8	59,321	83.1
May	715	8	64,866	90.7
June	714	4	71,602	100.3

SUMMERLAND.

	Number of wells		Average daily production in barrels	
	Producing	Completed	Total	Per well
1917—July	112	------------	155	1.4
August	112	------------	155	1.4
September	112	------------	155	1.4
October	112	------------	155	1.4
November	112	------------	155	1.4
December	112	------------	155	1.4
1918—January	112	------------	156	1.4
February	112	------------	155	1.4
March	112	------------	155	1.4
April	142	------------	148	1.0
May	142	------------	140	1.0
June	142	------------	149	1.0

WATSONVILLE.

	Number of wells		Average daily production in barrels	
	Producing	Completed	Total	Per well
1917—July	5	------------	75	15.0
August	5	------------	75	15.0
September	5	------------	75	15.0
October	5	------------	75	15.0
November	5	------------	75	15.0
December	5	------------	75	15.0
1918—January	5	------------	75	15.0
February	5	------------	75	15.0
March	5	------------	75	15.0
April	5	------------	75	15.0
May	5	------------	74	14.8
June	5	------------	75	15.0

OIL PRODUCTION, JUNE, 1918.

The extent to which oil is produced by various large concerns is shown by the following table for June, 1918:

Company	Coalinga					Kern River					McKittrick				
	Oil (bbls.)	Per cent	Wells	Per cent	Bbls. per well	Oil (bbls.)	Per cent	Wells	Per cent	Bbls. per well	Oil (bbls.)	Per cent	Wells	Per cent	Bbls. per well
Associated Oil Company[1]	979	2.2	59	5.2	16.6	8,112	37.7	507	26.4	16.0	2,125	24.6	83	27.4	25.6
Doheny companies[2]	3,682	8.2	102	9.0	36.1										
General Petroleum Corporation	358	.8	16	1.4	22.4										
Honolulu Consolidated Oil Company															
Atchison, Topeka and Santa Fe Railway Company (Fuel Department)[3]						671	3.1	122	6.4	5.5					
Shell Company of California	19,199	42.8	235	20.8	81.7										
Southern Pacific Company (Fuel Oil Department)	7,283	16.2	178	15.8	40.9	1,201	5.6	231	12.1	5.2	1,136	13.1	46	15.2	24.7
Standard Oil Company	3,657	8.2	137	12.1	26.7	Reports incomplete.					141	1.6	6	2.0	23.5
Union Oil Company of California	641	1.4	23	2.0	27.9										
Other companies	9,043	20.2	380	33.7	23.8	11,520	53.6	1,057	55.1	10.9	5,249	60.7	168	55.4	31.2
Totals[4]	44,842	100	1,130	100	39.6	21,504	100	1,917	100	11.2	8,651	100	303	100	28.6

OIL PRODUCTION, JUNE, 1918—Continued.

Company	Midway-Sunset					Lost Hills-Belridge					Los Angeles-Salt Lake				
	Oil (bbls.)	Per cent	Wells	Per cent	Bbls. per well	Oil (bbls.)	Per cent	Wells	Per cent	Bbls. per well	Oil (bbls.)	Per cent	Wells	Per cent	Bbls. per well
Associated Oil Company[1]	4,905	5.2	96	4.5	51.1	1,954	13.7	48	9.6	40.7	1,746	50.3	148	50.7	11.8
Doheny companies[2]	6,670	6.8	153	6.9	43.5	627	4.4	26	5.2	24.1	137	3.9	9	3.1	15.2
General Petroleum Corporation	5,752	6.1	163	7.7	35.2	5,205	36.6	183	36.4	28.5					
Honolulu Consolidated Oil Company	3,632	3.9	35	1.6	103.8										
Atchison, Topeka and Santa Fe Railway Company (Fuel Department)[3]	8,690	9.2	213	10.1	40.8										
Shell Company of California															
Southern Pacific Company (Fuel Oil Department)	14,476	15.4	226	10.7	64.0										
Standard Oil Company	13,504	14.4	352	16.7	38.4	1,188	8.3	55	10.9	21.6					
Union Oil Company of California	2,944	3.1	30	1.4	98.1	125	.9	6	1.2	20.9					
Other companies	33,475	35.9	846	40.4	39.6	5,152	36.1	185	36.7	27.8	1,588	45.8	135	46.2	11.7
Totals[4]	94,048	100	2,114	100	44.5	14,251	100	503	100	28.3	3,471	100	292	100	11.9

OIL PRODUCTION, JUNE, 1918—Continued.

Company	Whittier-Fullerton					Ventura-Newhall					Santa Maria-Lompoc				
	Oil (bbls.)	Per cent	Wells	Per cent	Bbls. per well	Oil (bbls.)	Per cent	Wells	Per cent	Bbls. per well	Oil (bbls.)	Per cent	Wells	Per cent	Bbls. per well
Associated Oil Company[1]	3,612	5.0	84	11.8	43.0	------	------	------	------	------	2,150	10.5	23	6.9	93.5
Doheny companies[2]	3,580	5.0	4	.5	895.3	302	8.1	48	10.4	6.3	5,961	29.0	37	11.1	161.1
General Petroleum Corporation	725	1.0	37	5.2	19.6	42	1.1	1	0.2	42.4	------	------	------	------	------
Honolulu Consolidated Oil Company	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------
Atchison, Topeka and Santa Fe Railway Company (Fuel Department)[3]	1,802	2.5	77	10.8	23.4	------	------	------	------	------	------	------	------	------	------
Shell Company of California	------	------	------	------	------	34	0.9	1	0.2	33.9	------	------	------	------	------
Southern Pacific Company (Fuel Oil Department)	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------
Standard Oil Company	45,240	63.2	156	21.8	290.0	234	6.2	65	14.0	3.6	------	------	------	------	------
Union Oil Company of California	8,921	12.5	94	13.2	94.9	407	10.9	83	17.9	4.9	9,893	48.1	191	57.2	51.8
Other companies	7,722	10.8	262	36.7	29.5	2,735	72.8	265	57.3	10.3	2,545	12.4	83	24.8	30.6
Totals[1]	71,602	100	714	100	100.5	3,754	100.0	463	100.0	8.1	20,549	100.0	334	100.0	61.5

OIL PRODUCTION, JUNE, 1918—Continued.

Company	Total state				
	Oil (bbls.)	Per cent	Wells	Per cent	Bbls. per well
Associated Oil Company[1]	25,583	9.1	1,048	13.5	24.4
Doheny companies[2]	20,959	7.3	379	4.9	55.3
General Petroleum Corporation	12,082	4.3	400	5.1	30.2
Honolulu Consolidated Oil Company	3,632	1.3	35	0.4	103.8
Atchison, Topeka and Santa Fe Railway Company (Fuel Department)[3]	11,163	4.0	412	5.3	27.1
Shell Company of California	19,233	6.8	236	3.0	81.5
Southern Pacific Company (Fuel Oil Department)	24,096	8.5	681	8.8	35.4
Standard Oil Company	63,964	22.6	771	9.9	82.9
Union Oil Company of California	22,931	8.1	427	5.5	53.7
Other companies	79,029	28.0	3,381	43.6	23.4
Totals[4]	282,672	100.0	7,770	100.0	36.4

[1] Includes Amalgamated Oil Company.

[2] Includes American Oilfields Company, American Petroleum Company, California Star Oil Company, Doheny-Pacific Petroleum Company, Midland Oil Company, Midland Oilfields Company, Niles Lease Company, Pan-American Petroleum Company, Pan-American Investment Corporation, Petroleum Midway Company, Ltd., Red Star Petroleum Company.

[3] Includes Chanslor-Canfield Midway Oil Company, Petroleum Development Company.

PROVED OIL LAND AND DEGREE OF DEVELOPMENT.

The extent of ownership or control of proved oil land, and degree of development, is shown in the following table. A similar tabulation was made by the writer for the year 1914, in Bulletin 69[1]. The amounts given under "acres per well" in the present tabulation show to what extent the proved lands of various concerns have been drilled. There has been an increase of 20 per cent in the total proved acreage of the state, and an increase of 10 per cent in the number of wells producing. It must be remembered that the figures of four years ago were compiled under conditions less favorable to accuracy than exist now. Therefore the comparisons must be liberally interpreted.

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[1] Petroleum Industry of California, Bull. 69, Cal. State Min. Bur. pp. 14–17.

COMPARISON OF OWNERSHIP OR CONTROL OF PROVED OIL LAND AND DEGREE OF DEVELOPMENT, JUNE, 1918.

Company	Coalinga			Kern River			McKittrick			Midway-Sunset			Lost Hills-Belridge		
	Acres	Wells	Acres per well	Acres	Wells	Acres per well	Acres	Wells	Acres per well	Acres	Wells	Acres per well	Acres	Wells	Acres per well
Associated Oil Company[1]	560	59	9.5	2,397	507	4.7	543	83	6.5	1,520	96	15.8	305	48	6.4
Doheny companies[2]	1,117	102	10.9							1,974	153	12.9	105	26	4.0
General Petroleum Corporation	160	16	10.0							1,349	163	8.3	963	183	5.3
Honolulu Consolidated Oil Company										2,701	35	77.2			
Atchison, Topeka and Santa Fe Railway Company (Fuel Department)[3]				145	122	1.2				2,721	213	12.8			
Shell Company of California	2,432	235	10.3												
Southern Pacific Company (Fuel Oil Department)	4,516	178	25.4	437	231	1.9	185	46	4.0	13,129	226	58.1			
Standard Oil Company	760	137	5.6	265	80	3.3	60	6	10.0	5,206	352	14.8	491	55	8.9
Union Oil Company of California	230	23	10.0							810	30	27.0	40	6	6.7
Other companies	3,218	380	8.4	3,691	977	3.8	654	168	3.9	16,106	846	19.0	1,150	185	6.2
Totals	12,993	1,130	11.5	6,935	1,917	3.6	1,442	303	4.8	45,516	2,114	21.5	3,054	503	6.1

COMPARISON OF OWNERSHIP OR CONTROL OF PROVED OIL LAND AND DEGREE OF DEVELOPMENT, JUNE, 1918—Continued.

Company	Los Angeles-Salt Lake			Whittier-Fullerton			Ventura-Newhall			Santa Maria-Lompoc			Total state		
	Acres	Wells	Acres per well	Acres	Wells	Acres per well	Acres	Wells	Acres per well	Acres	Wells	Acres per well	Acres	Acres	per well Wells
Associated Oil Company[1]	803	148	5.4	470	84	5.6				749	23	32.6	7,347	1,048	7.0
Doheny companies[2]	19	9	2.1	35	4	8.7	136	48	2.8	900	37	24.3	4,286	379	11.3
General Petroleum Corporation				102	37	2.8	10	1	10.0				2,584	400	6.5
Honolulu Consolidated Oil Company													2,701	35	77.2
Atchison, Topeka and Santa Fe Railway Company (Fuel Department)[3]				231	77	3.0							3,097	412	7.5
Shell Company of California							10	1	10.0				2,442	236	10.3
Southern Pacific Company (Fuel Oil Department)													18,267	681	26.8
Standard Oil Company				1,264	156	2.2	141	65	2.2				8,187	851	9.6
Union Oil Company of California				1,279	94	13.6	245	83	3.0	5,594	191	29.3	8,198	427	19.2
Other companies	195	135	1.4	1,220	262	4.7	1,385	265	5.2	2,552	83	30.7	30,171	3,301	9.1
Totals	1,017	292	3.5	4,601	714	6.4	1,927	463	4.2	9,795	334	29.3	87,280	7,770	11.2

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[1] Includes Amalgamated Oil Company.

[2] Includes American Oilfields Company, American Petroleum Company, California Star Company, Doheny-Pacific Petroleum Company, Midland Oil Company, Midland Oilfields Company, Niles Lease Company, Pan-American Petroleum Company, Pan-American Petroleum Investment Corporation, Petroleum Midway Company, Red Star Petroleum Company.

[3] Includes Petroleum Development and Chanslor-Canfield Midway Oil Company.

Comparison of the present extent and development of our proved land with that of four years ago affords some very valuable information. The enlargment of the total proved acreage is probably the most significant and gratifying feature. It emphasizes the fact that it is extremely difficult to forecast the extent of our oil resources, and should serve to restrain pessimistic forecasters. On the other hand, it must be realized that the oil resources have a definite limitation which forbids wasteful production or use.

The acreage per well has not greatly changed, and shows that there still remains a wide margin for development of the proved land. The yield per well will, of course, be expected to decline along with the increased development. The margin for development of proved land remaining for each of the various large concerns is of interest to investors and the public; but, of course, this margin must be liberally interpreted.

The increase in the number of wells owned by the various large concerns includes the wells acquired by purchase and also new wells drilled.

The percentage of the total proved area owned by the various large concerns has not greatly changed. In other words, the danger of monopoly of the oil lands is no nearer than it was four years ago.

The great increase in the proportion of oil produced by the Standard Oil Company—22.6 per cent as against 9.4 per cent—is evidence of the reward following active development campaigns.

The fact that just nine concerns own or control as much as 65 per cent of the oil land in the state, which yields fully 72 per cent of the production of the state, is ample explanation of the policy of this department in setting forth in considerable detail the operations and holdings of these large companies. Several of the concerns, through their position as regular marketers, also exercise a strong control over the operations of many others. The responsibility of the large concerns for the care and protection of our oil fields is, therefore, obvious, and the department has given particular attention to seeing that they adopted and followed the most approved methods. It should be clearly and unmistakably understood that in the past some of the largest operators have also been the most careless and wasteful. That condition is now being remedied, but the task is not yet completed.[1]

The proportion of water and oil produced by certain concerns in the various fields of the state is shown by the accompanying diagram.

COLLECTION OF FUNDS BY ASSESSMENT.

The collection of funds by assessment is provided for in chapter 718 of the Statutes of 1915, amended 1917, a copy of which may be obtained

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[1] Bull. No. 69, Cal. State Min. Bur. p. 4.

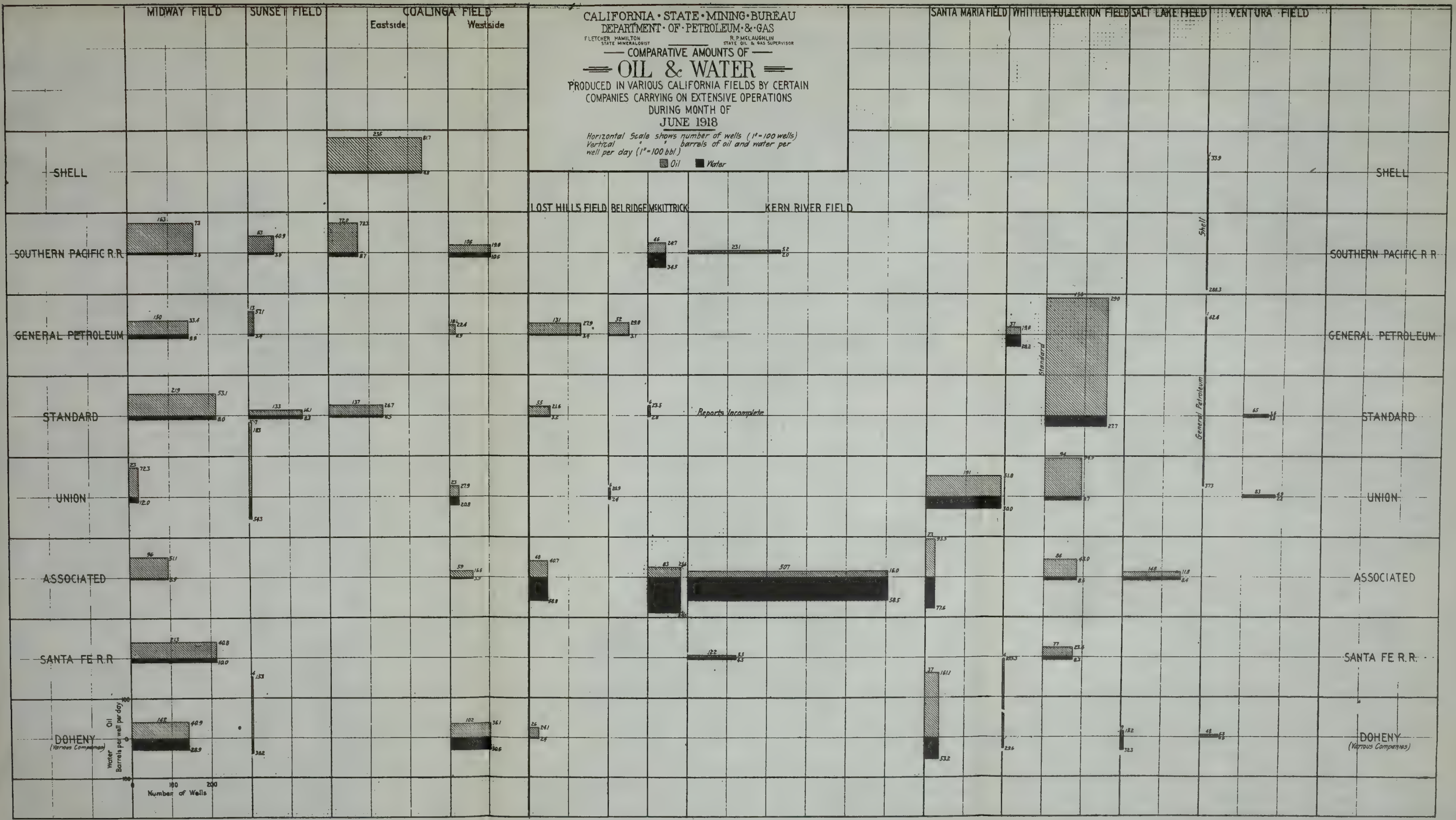

CALIFORNIA • STATE • MINING • BUREAU
DEPARTMENT • OF • PETROLEUM • & • GAS
FLETCHER HAMILTON
STATE MINERALOGIST
R. P. McLAUGHLIN
STATE OIL & GAS SUPERVISOR
COMPARATIVE AMOUNTS OF
OIL & WATER
PRODUCED IN VARIOUS CALIFORNIA FIELDS BY CERTAIN
COMPANIES CARRYING ON EXTENSIVE OPERATIONS
DURING MONTH OF
JUNE 1918
Horizontal Scale shows number of wells (1" = 100 wells)
Vertical " " barrels of oil and water per well per day (1" = 100 bbl.)
▨ Oil
■ Water
MIDWAY FIELD
SUNSET FIELD
COALINGA FIELD
Eastside
Westside
LOST HILLS FIELD
BELRIDGE
McKITTRICK
KERN RIVER FIELD
SANTA MARIA FIELD
WHITTIER-FULLERTON FIELD
SALT LAKE FIELD
VENTURA FIELD
SHELL
SOUTHERN PACIFIC R.R.
GENERAL PETROLEUM
STANDARD
UNION
ASSOCIATED
SANTA FE R.R.
DOHENY
(Various Companies)
235
81.7
163
73
63
40.9
72.0
72.3
8.7
106
19.8
10.6
46
24.7
34.5
231
5.2
2.0
150
33.4
13
57.1
131
27.9
52
29.8
37
19.8
28.2
158
290
1
42.4
219
53.1
8.0
133
16.1
137
26.7
55
21.6
6
23.5
Reports Incomplete
27.7
65
7
183
23
72.3
12.0
543
23
27.9
20.8
6
20.9
191
51.8
30.0
94
373
83
96
51.1
59
16.6
48
40.7
83
507
16.0
58.5
23
93.5
77.6
84
42.0
148
11.8
8.4
213
40.8
10.0
122
77
23.6
4
153
37
161.1
142
40.9
28.9
302
102
36.1
30.6
26
24.1
53.2
296
182
323
48
Shell
33.9
288.3
Standard
General Petroleum
Oil
Water
Barrels per well per day
100
0
100
0
100
200
Number of Wells

FIG. 2.

in convenient form by addressing the State Mineralogist, Ferry Building, San Francisco.

The money received from collection of the assessment comprises the petroleum and gas fund and is used for the support of the Petroleum Department of the State Mining Bureau, and for the repair of oil wells. The rates, shown on the accompanying statement and used in determining the various items, are determined in accordance with sections 23, 24, 25, 27, 46 and 47 of the said statute. The detailed method is as follows:

The amount of money to be raised annually, as provided in section 27, is sufficient to maintain the petroleum and gas fund at an amount not exceeding one hundred fifty thousand dollars. The amount this year is one hundred twenty-eight thousand three hundred seventy-five dollars. One-tenth of the above mentioned sum of one hundred twenty-eight thousand three hundred seventy-five dollars is levied upon the oil land of the state. The remaining nine-tenths is levied upon the oil produced and the gas produced and sold. For the purpose of this assessment ten thousand cubic feet of gas is considered equal to one barrel of oil. The amounts of land, oil and gas and the number of producing wells in the various counties were determined to be as follows:

County	Land (acres)	Oil (bbls.)	Gas (10 M.)	Wells (number)
Fresno	12,993	16,146,797	59,189	1,131
Kern	56,947	52,688,711	1,927,506	4,716
Los Angeles	2,401	4,357,162	24,175	748
Orange	3,418	14,568,930	655,027	467
Ventura	1,726	989,726	------------	355
Santa Barbara	9,023	5,589,223	60,157	385
San Luis Obispo	772	74,143	------------	18
Santa Clara	80	18,855	------------	14
Totals	87,360	94,433,547	2,726,054	7,834

Expenditure in repairing wells is to be repaid by satisfaction of a lien upon the property where the work is done. The rates applied in levying the total assessment are $.146 per acre of oil land and $.00119 per barrel of oil or per ten thousand cubic feet of gas.

FINANCIAL STATEMENT.

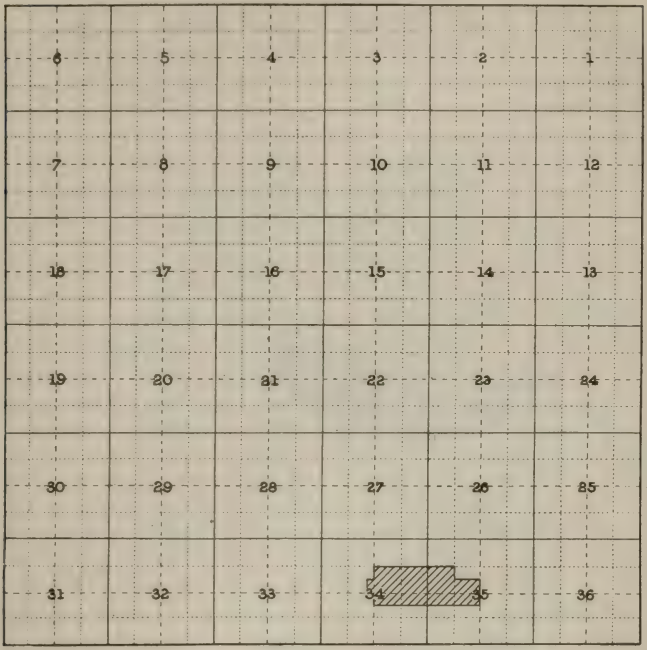
By W. W. THAYER, Secretary.

CALIFORNIA STATE MINING BUREAU.

RECEIPTS.

Balance from sixty-eighth fiscal year		$65,345 05	
Receipts of 1916 assessments		2,168 44	
Receipts of 1917 assessments		43,368 94	
Reimbursements of Fund:			
Salaries	$117 26		
Miscellaneous	28 94	146 20	
Total receipts			$111,028 63

T. 2 S., R. 10 W., S. B. M.—Los Angeles County.



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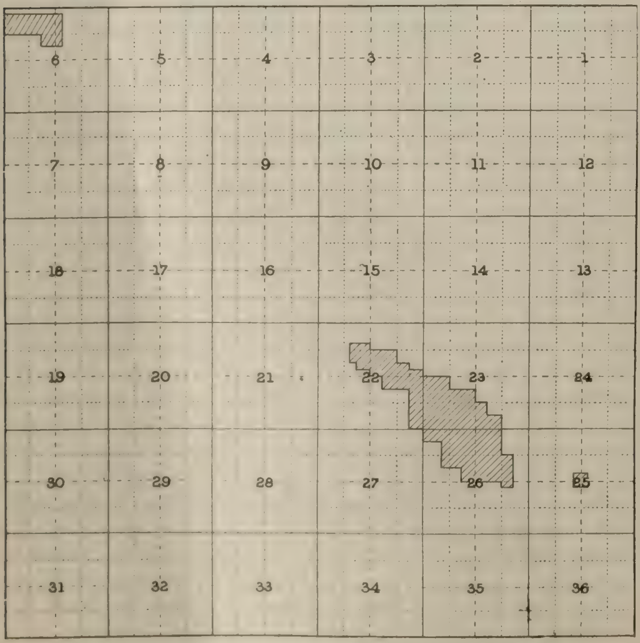

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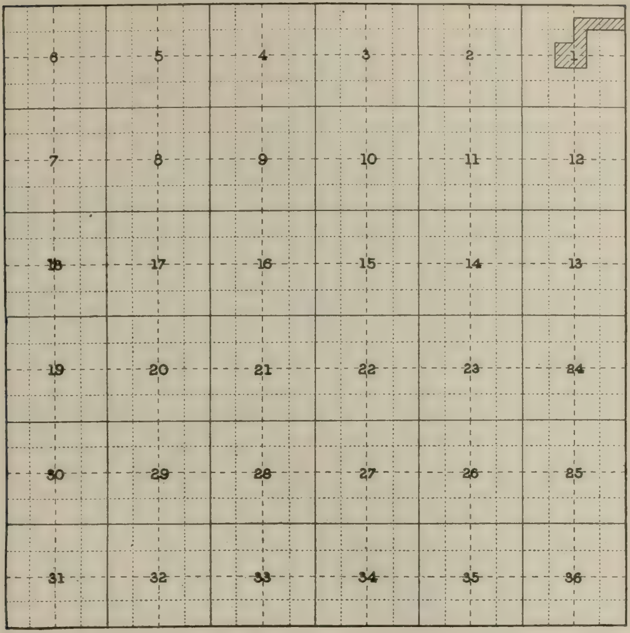

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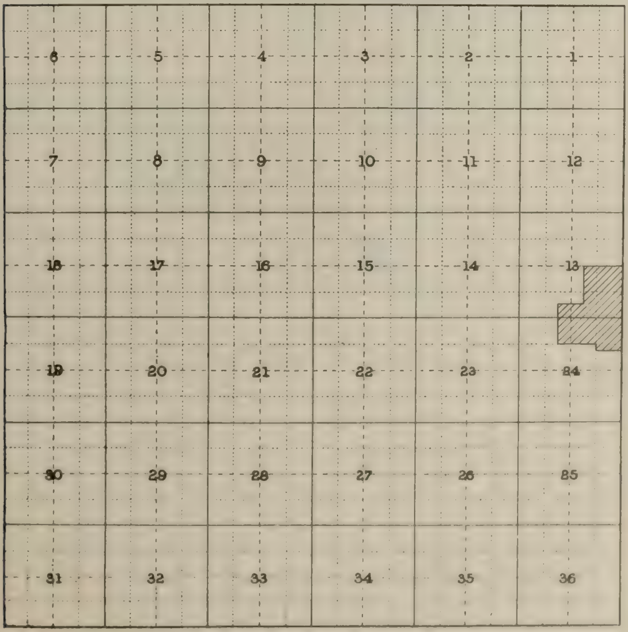

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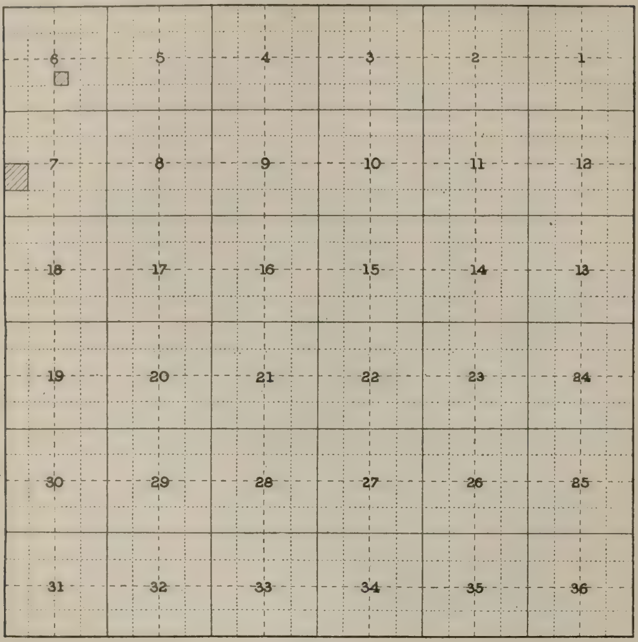

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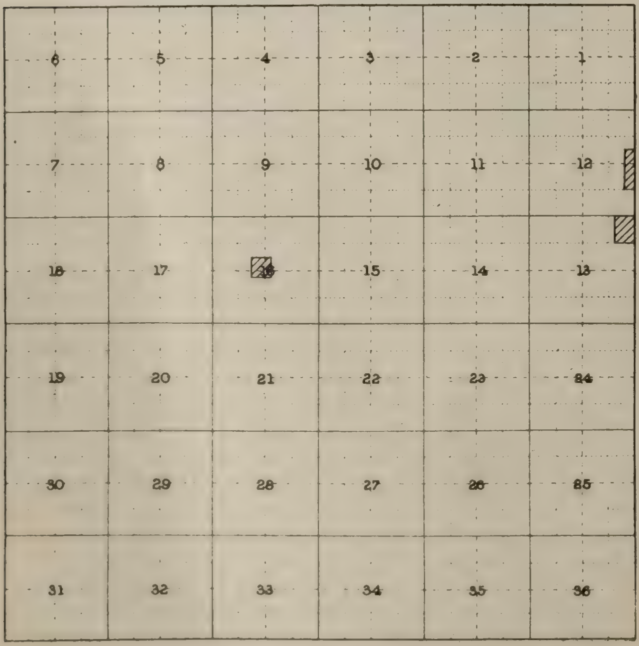

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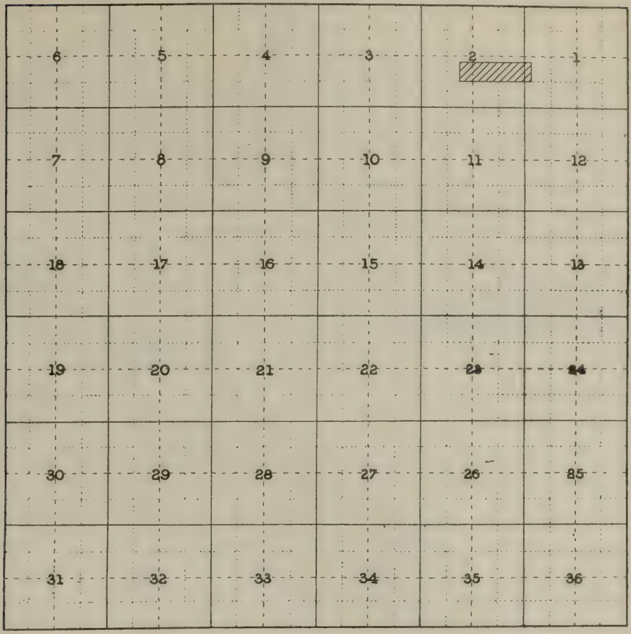

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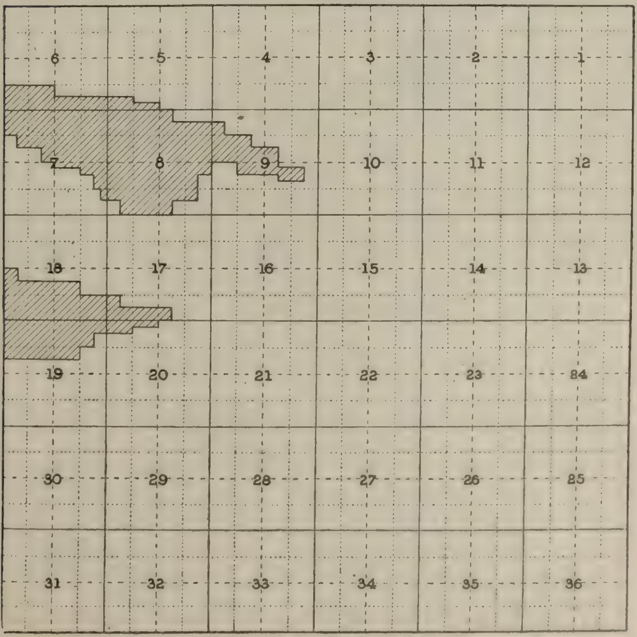

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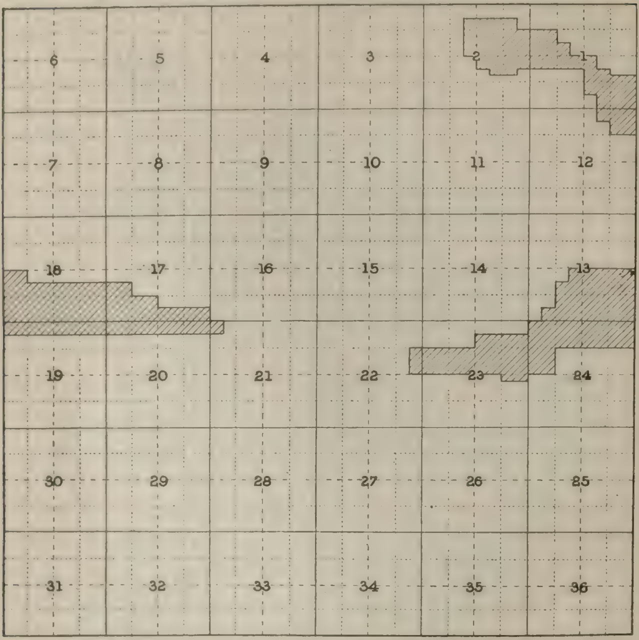

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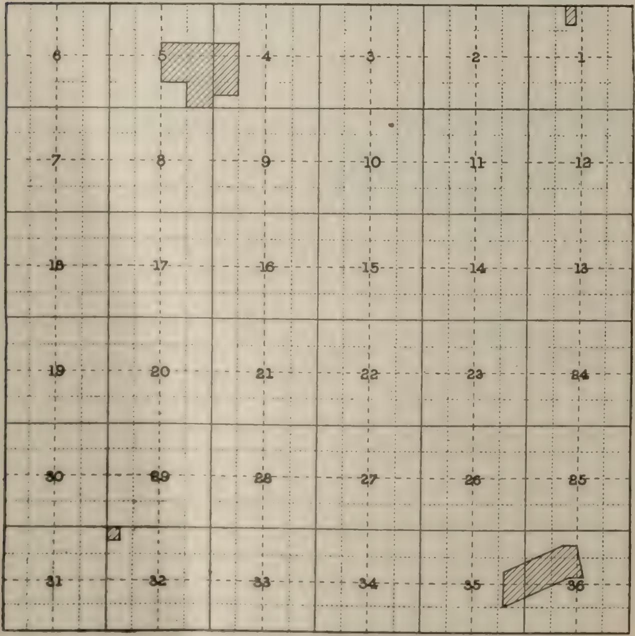

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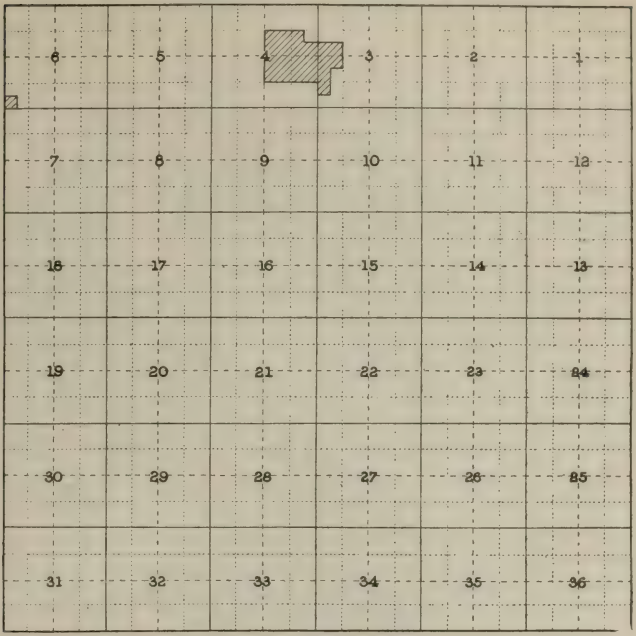

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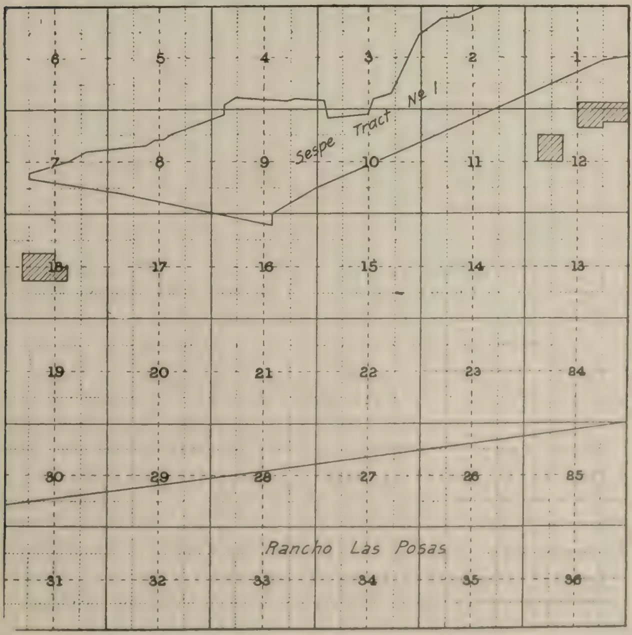

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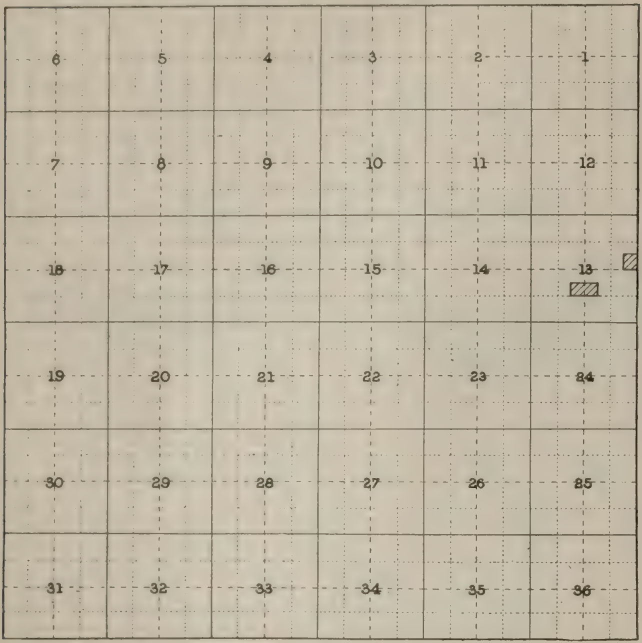

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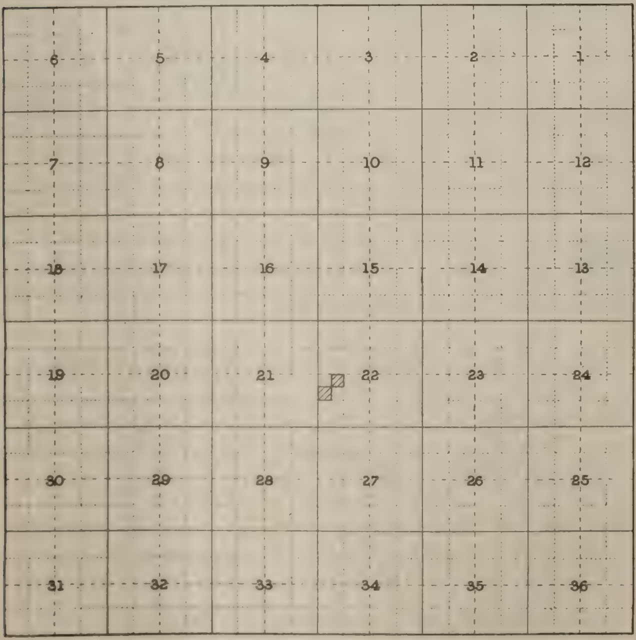

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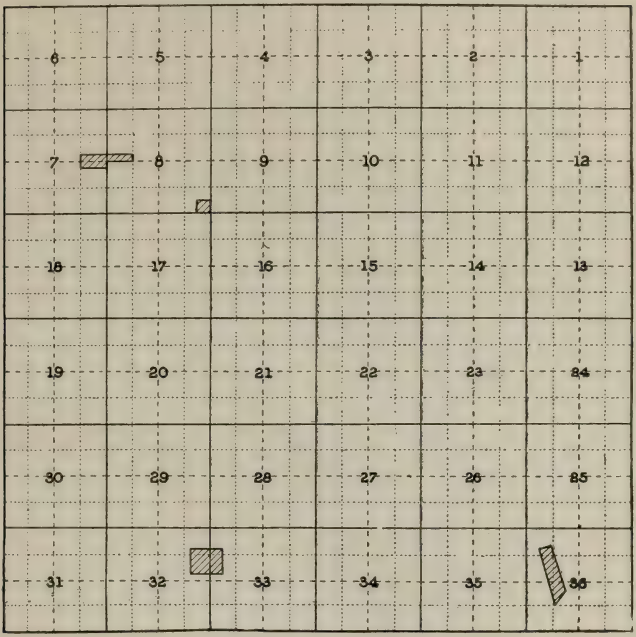

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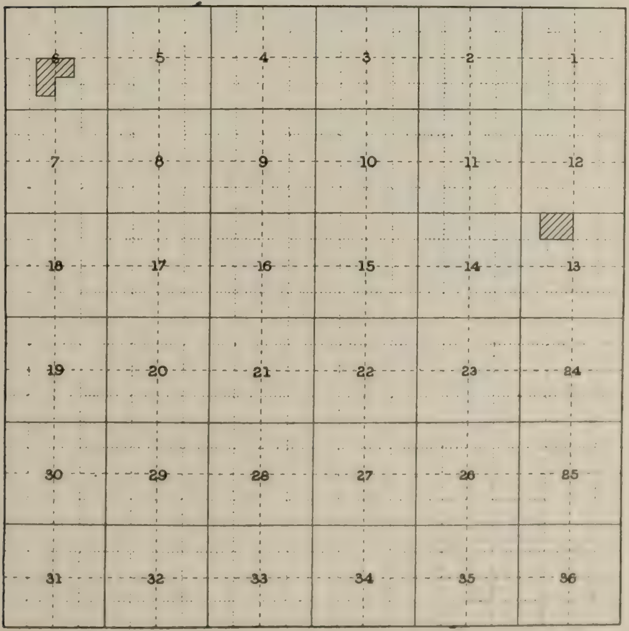

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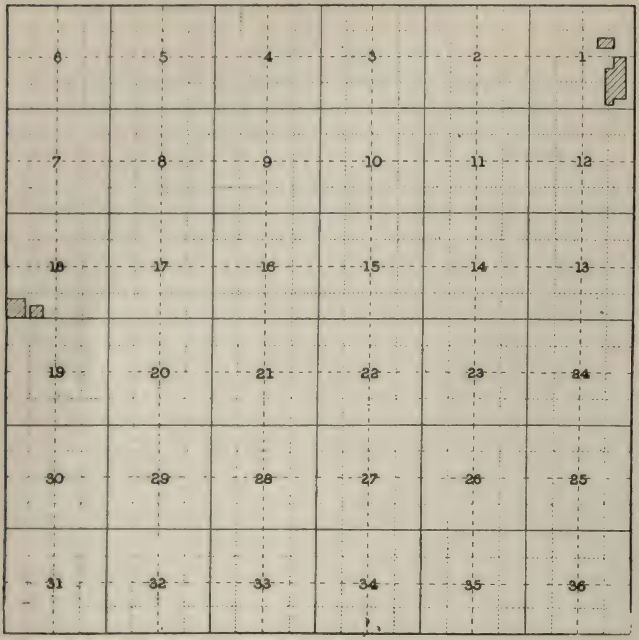

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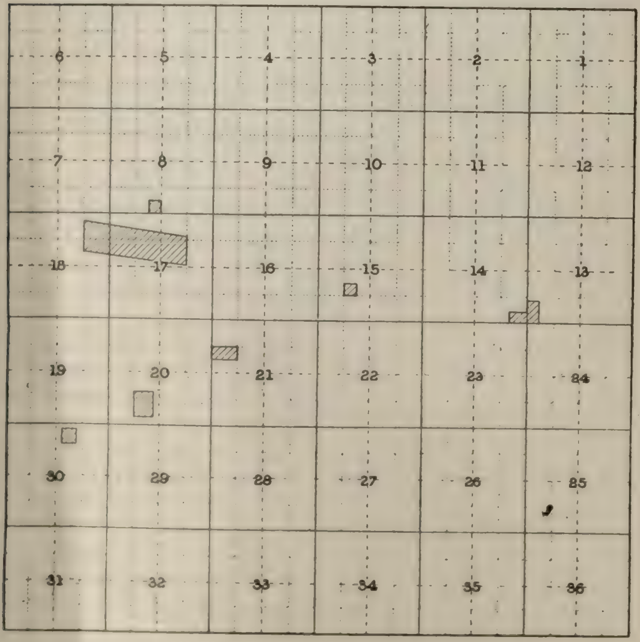

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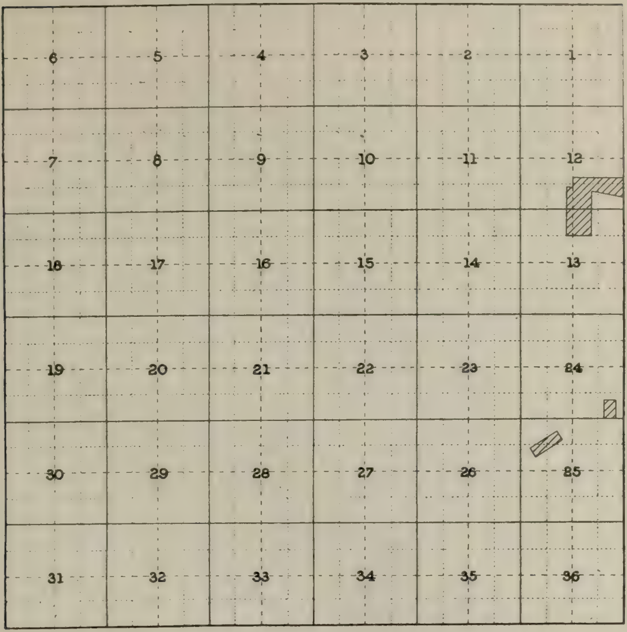

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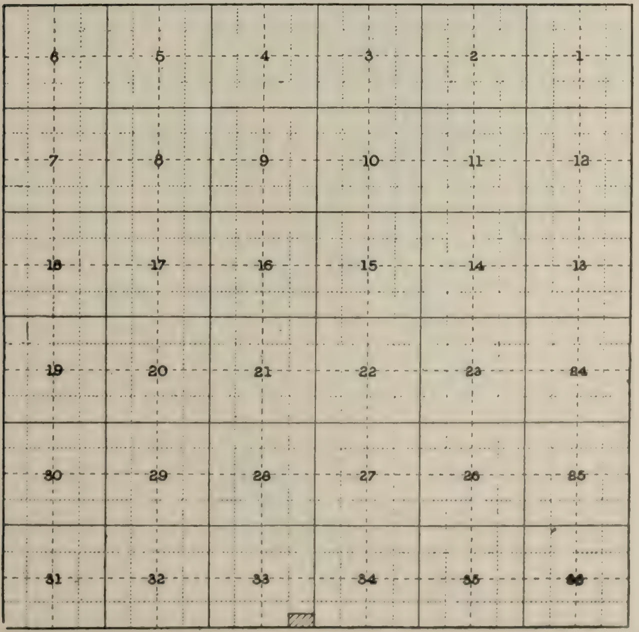

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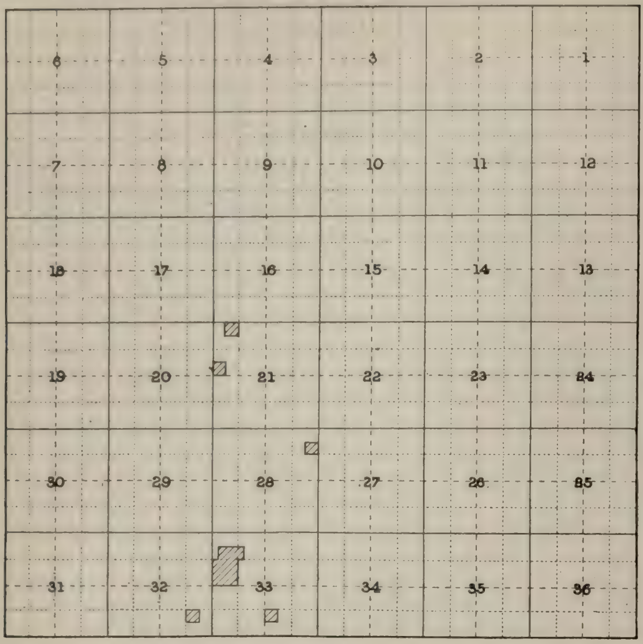
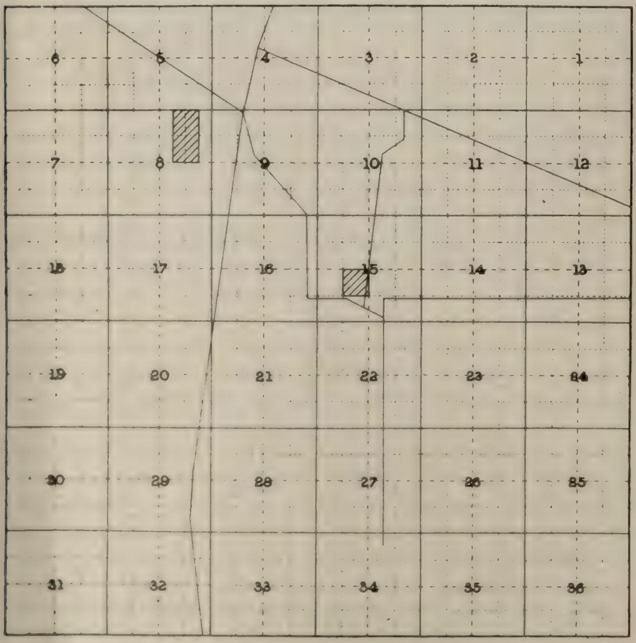


T. 8 N., R. 32 W., S.B. M. — SANTA BARBARA COUNTY.



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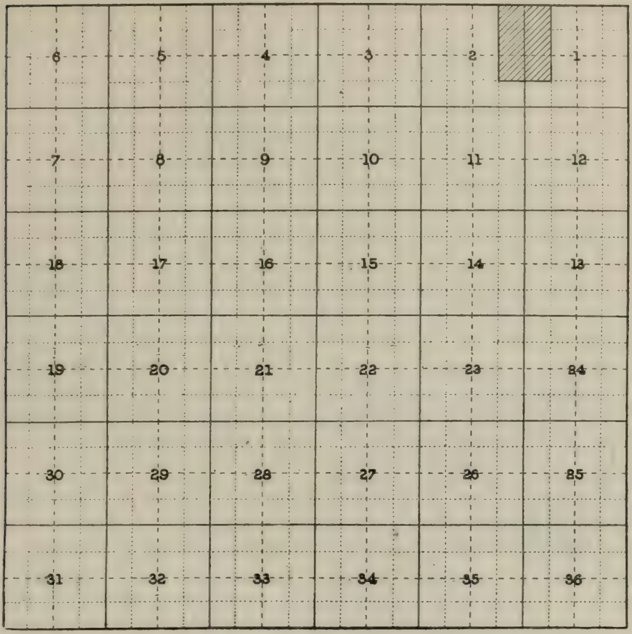

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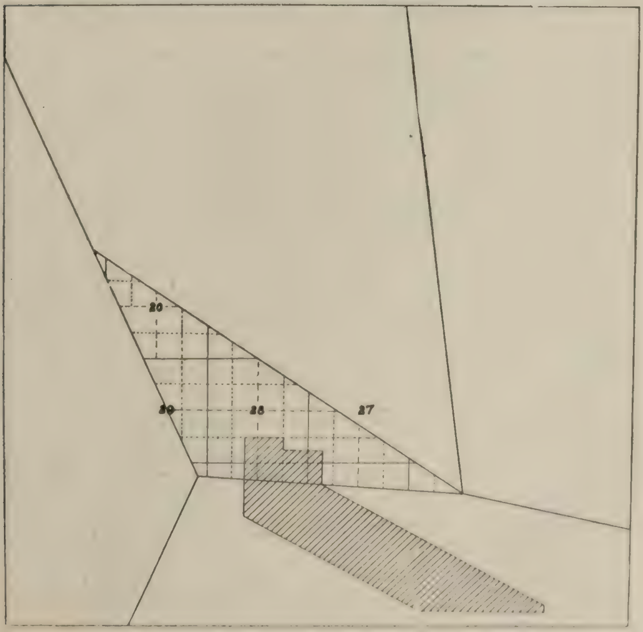

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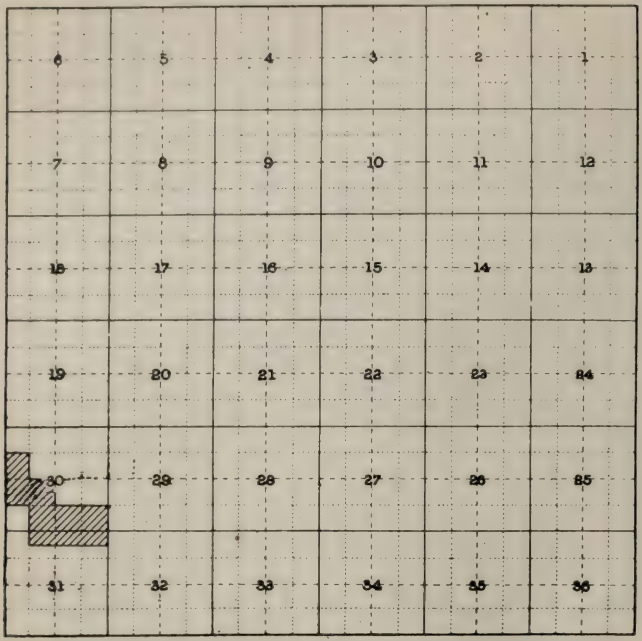

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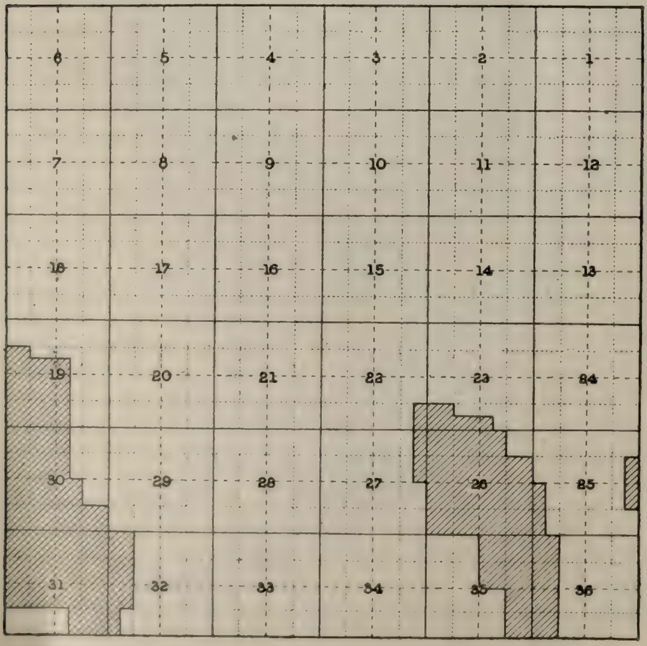

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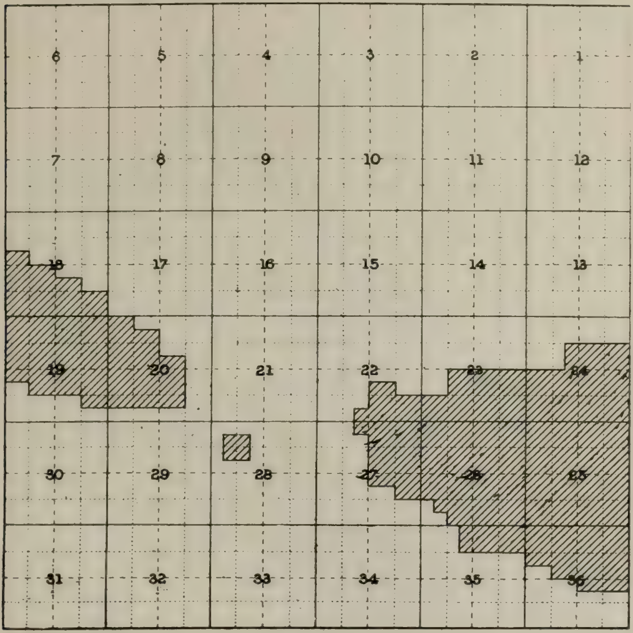

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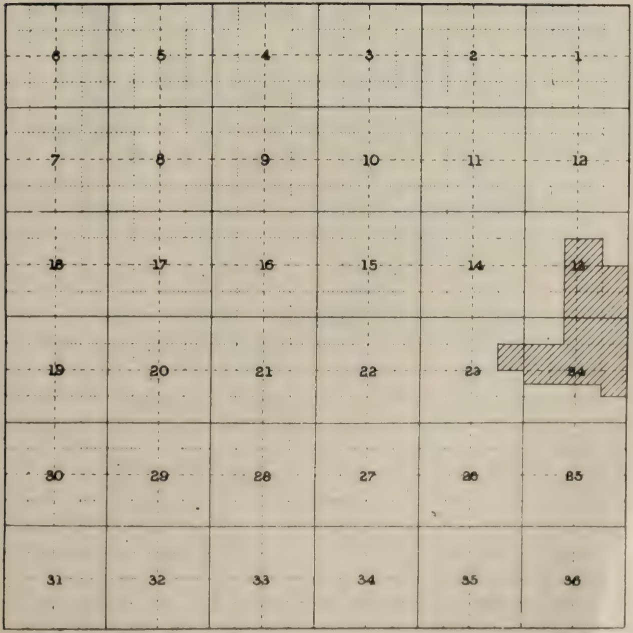

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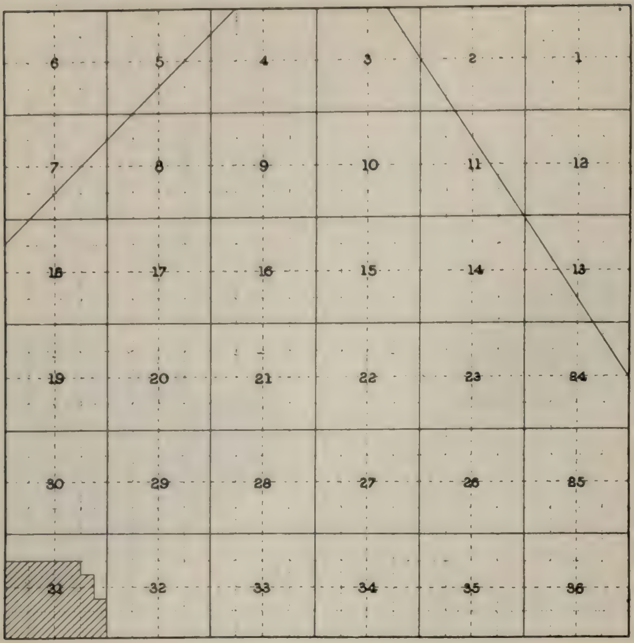

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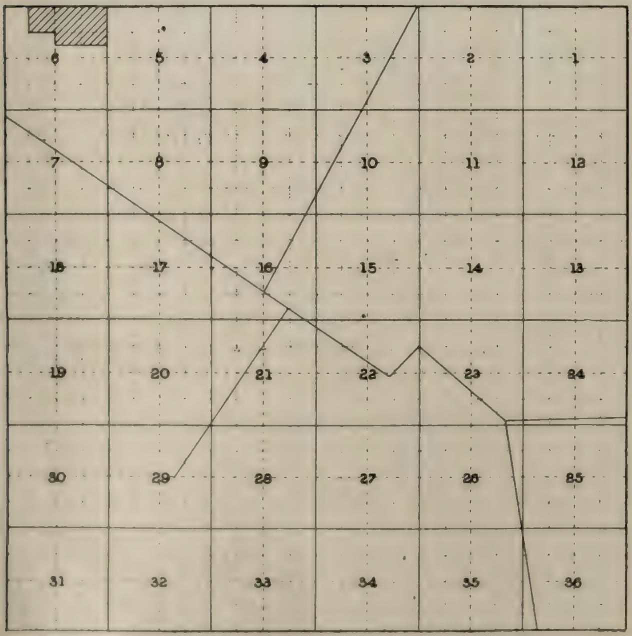

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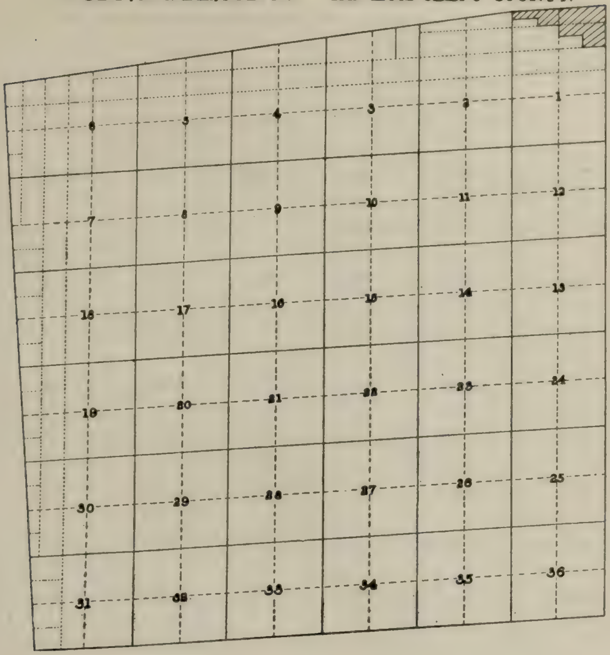

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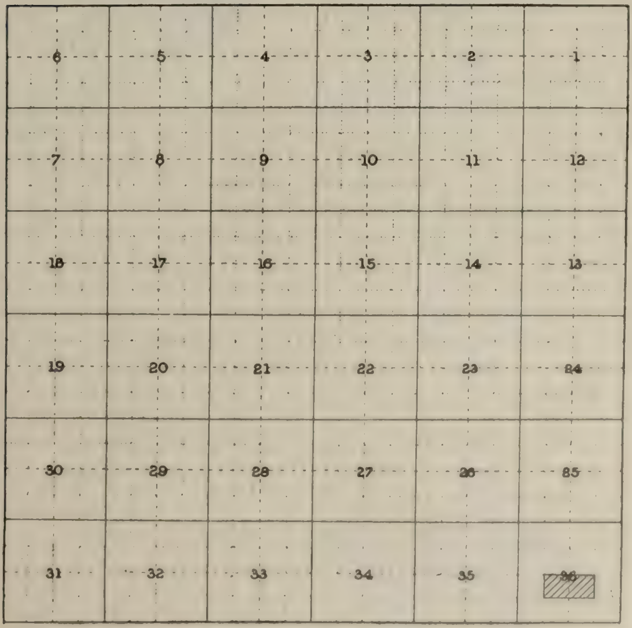

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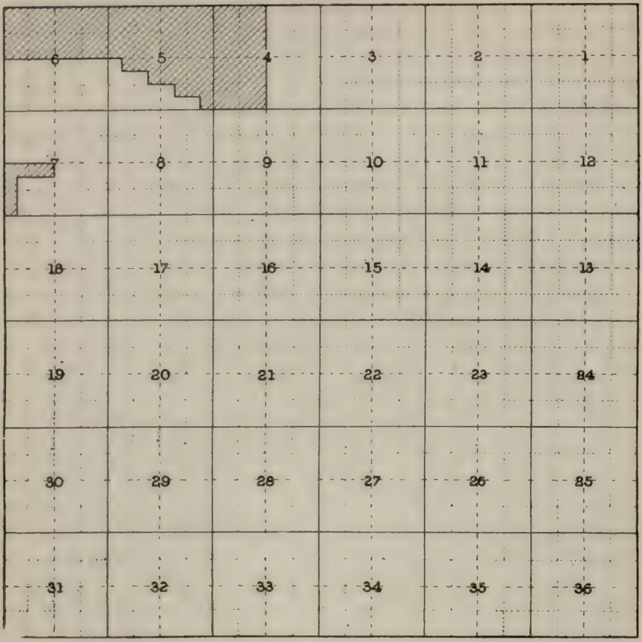

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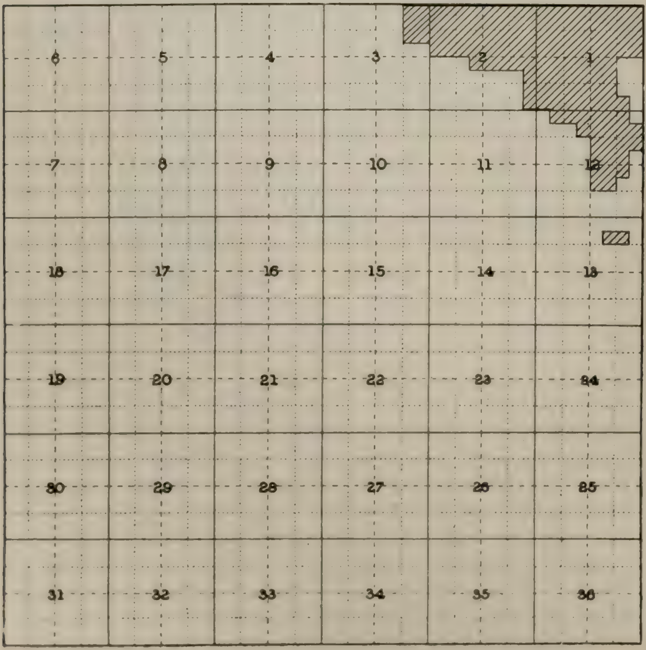

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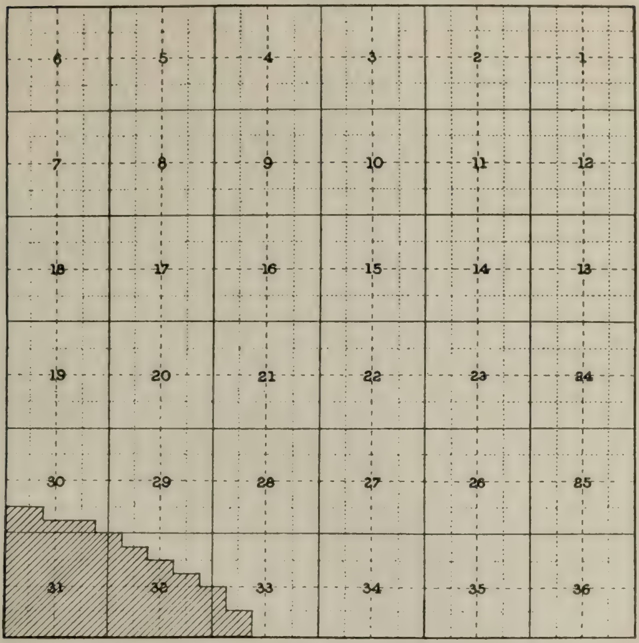

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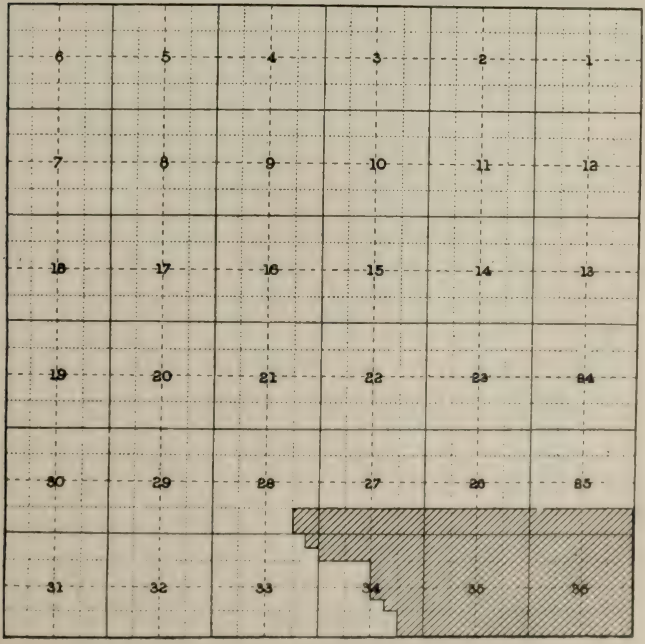

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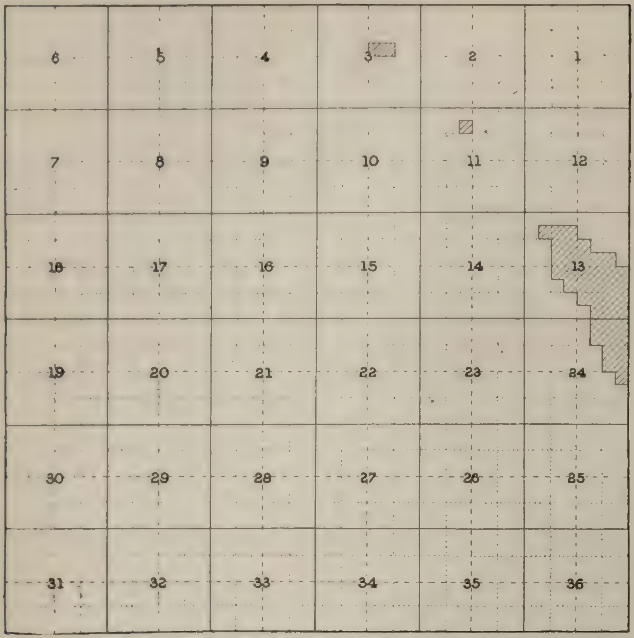

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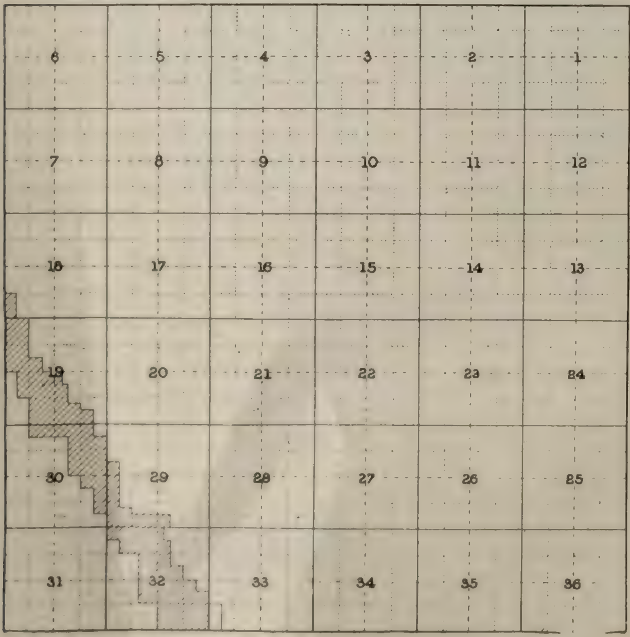

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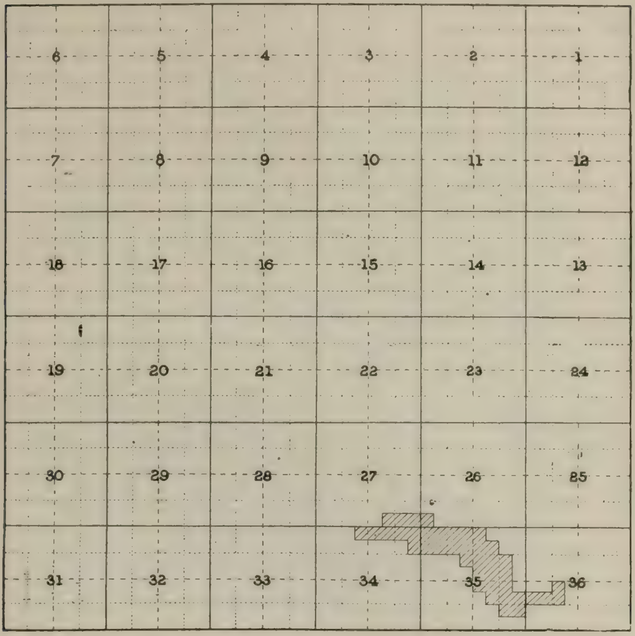

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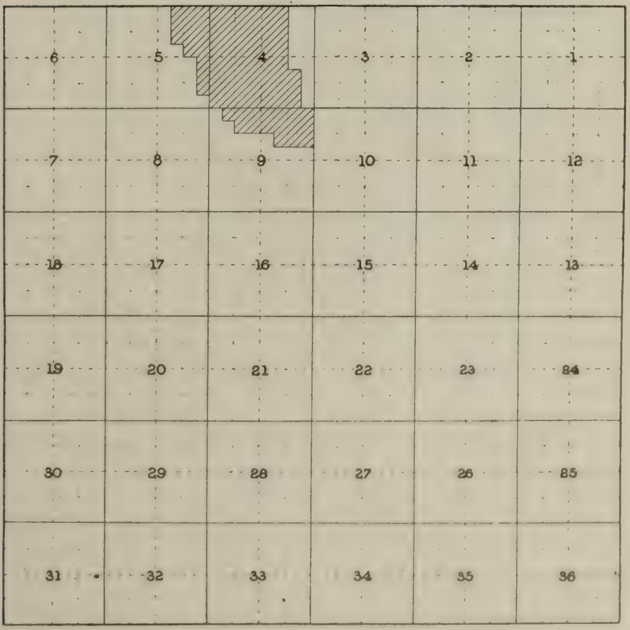

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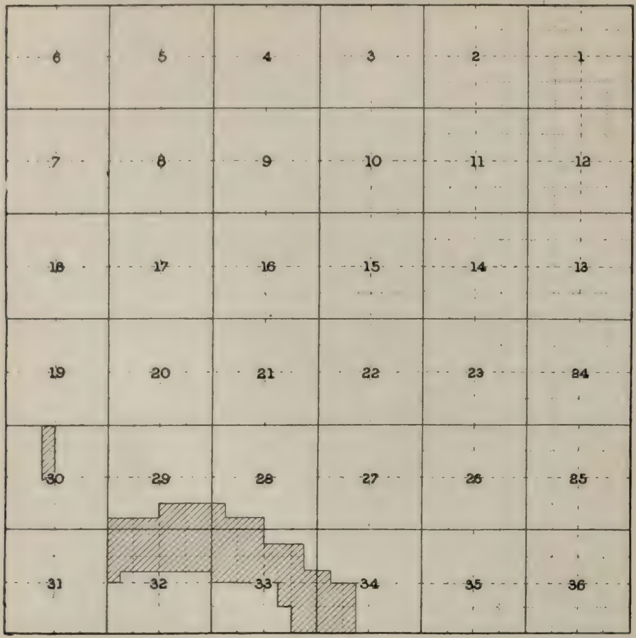

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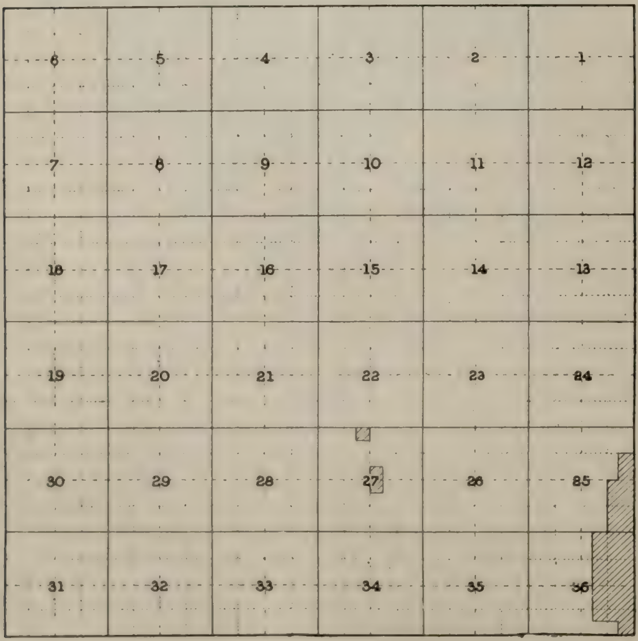

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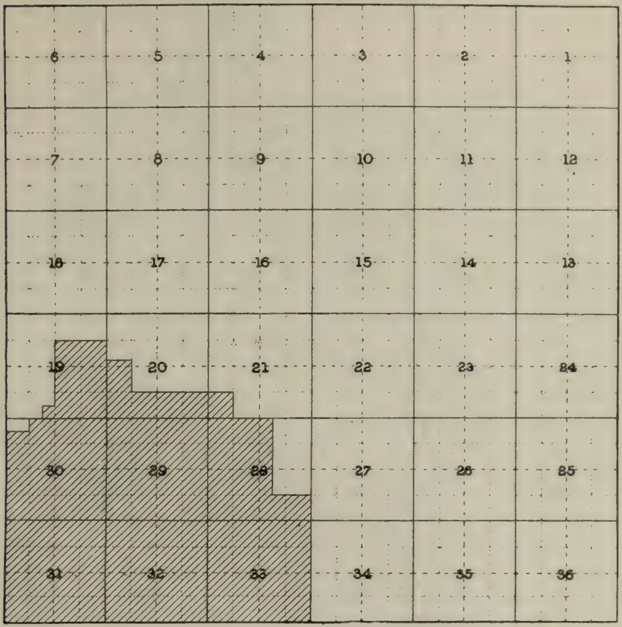

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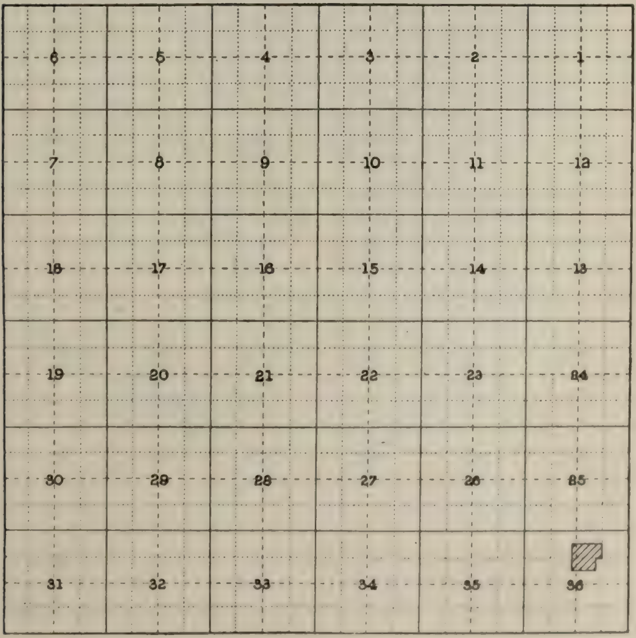

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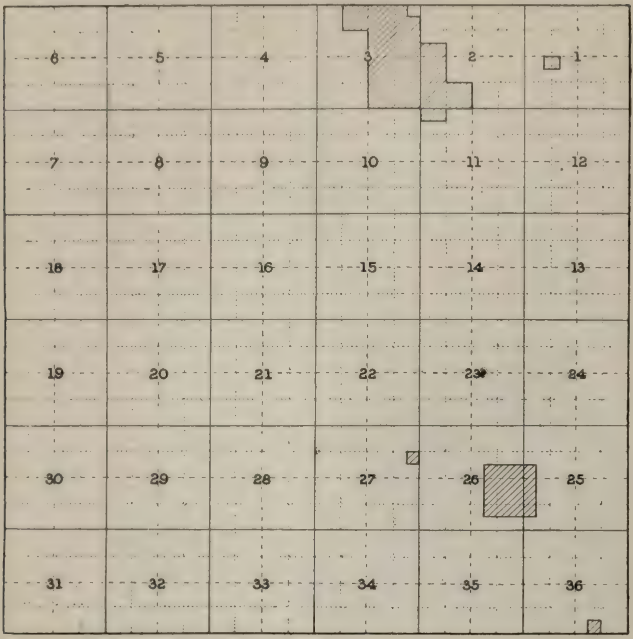

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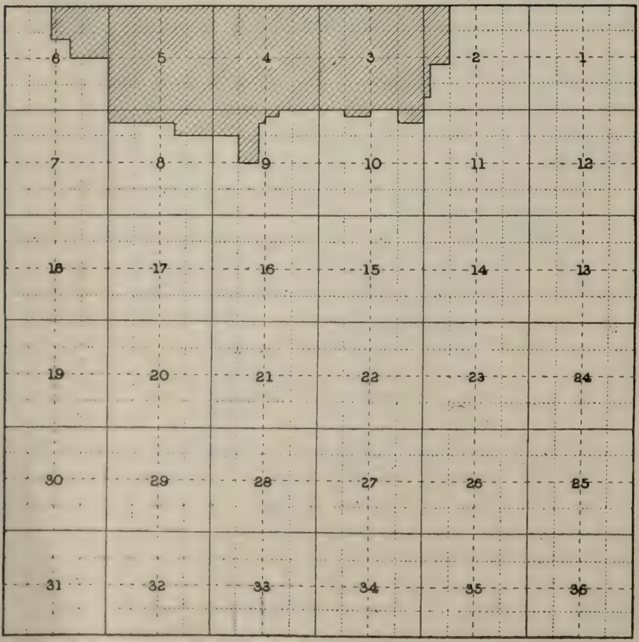
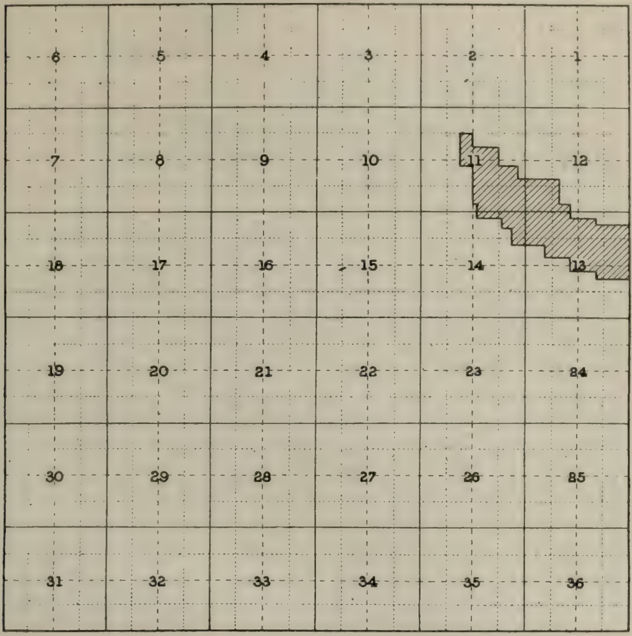


T.30 S., R.21 E., M.D. M — KERN COUNTY.



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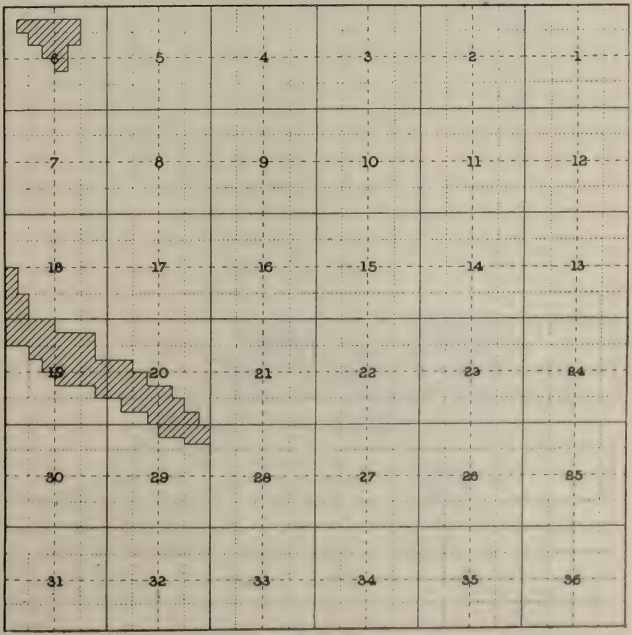

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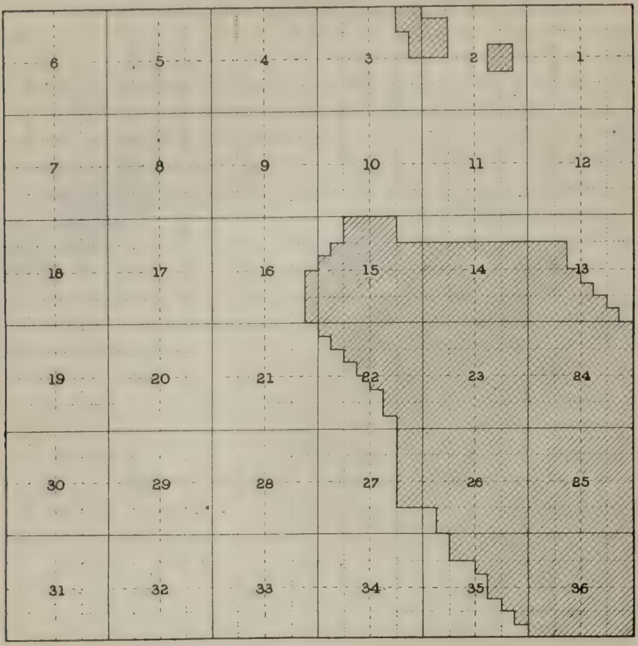

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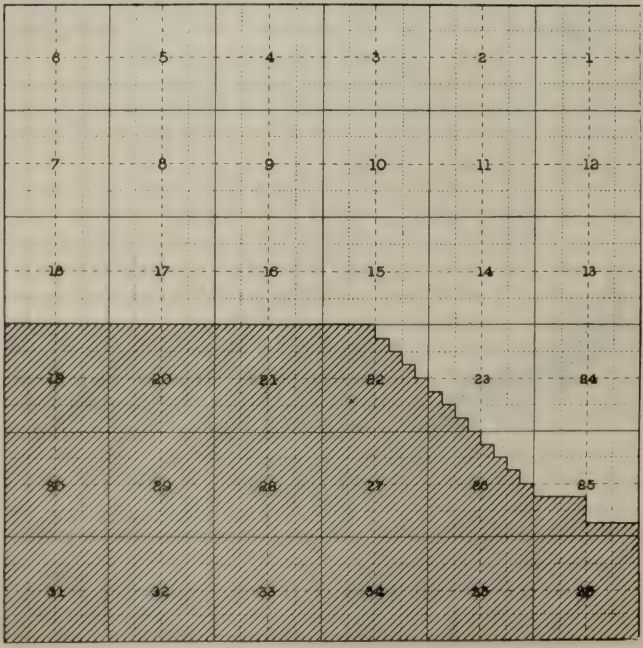

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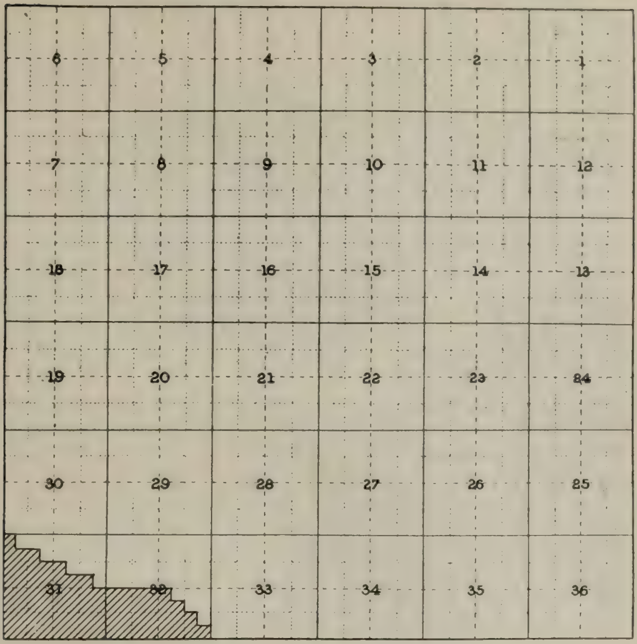

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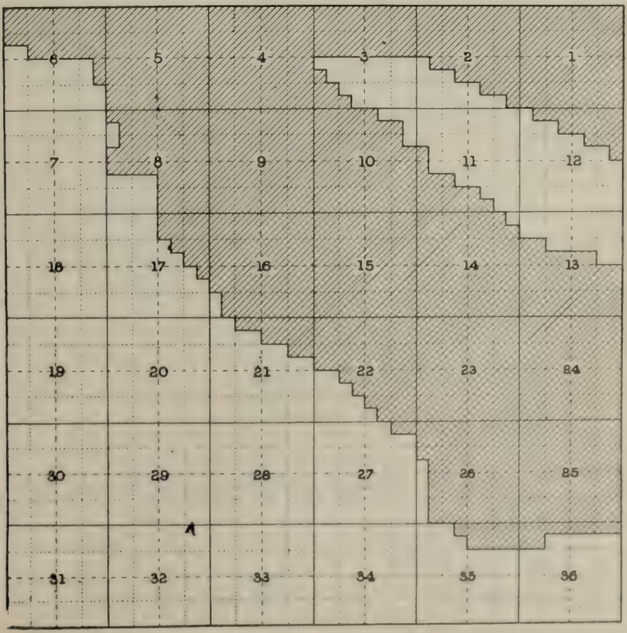
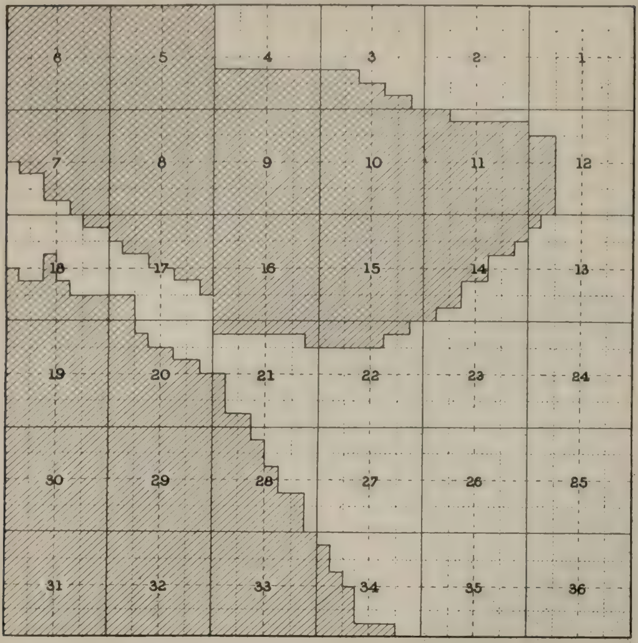
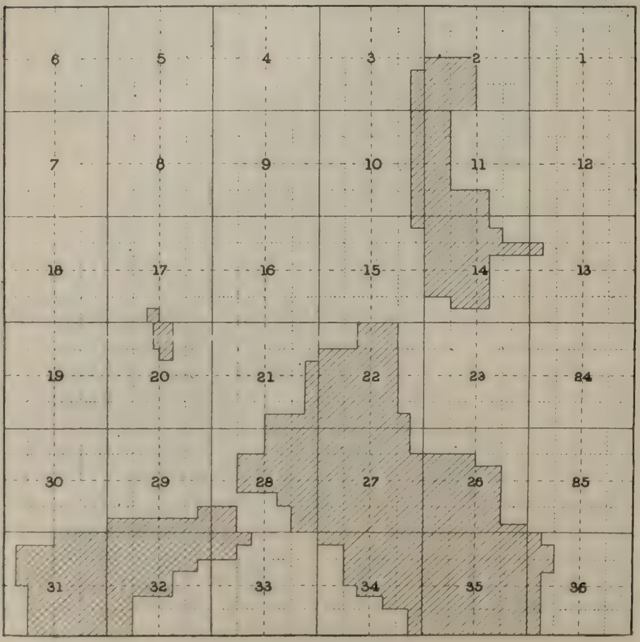


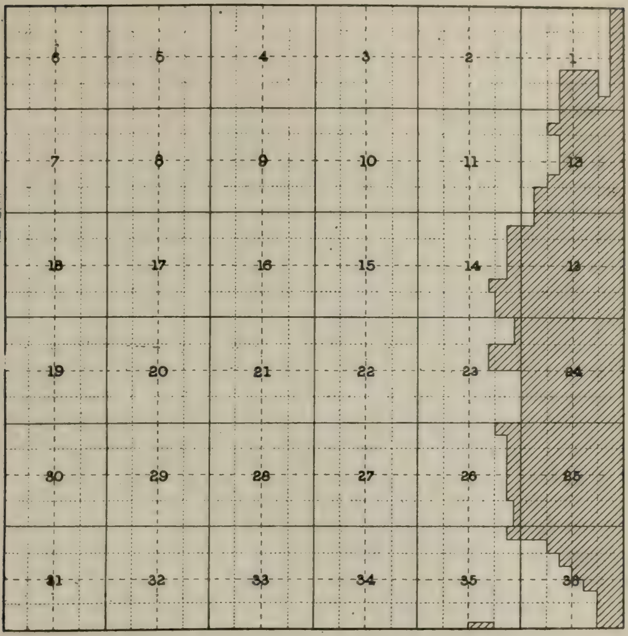
T. 32 S., R. 24 E., M.D.M. — KERN COUNTY.



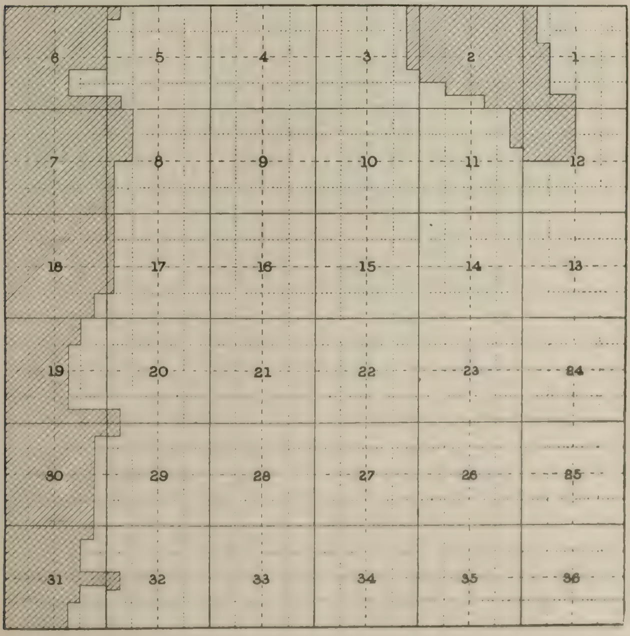
T. 19 S., R. 15 E., M.D.M. — FRESNO COUNTY.



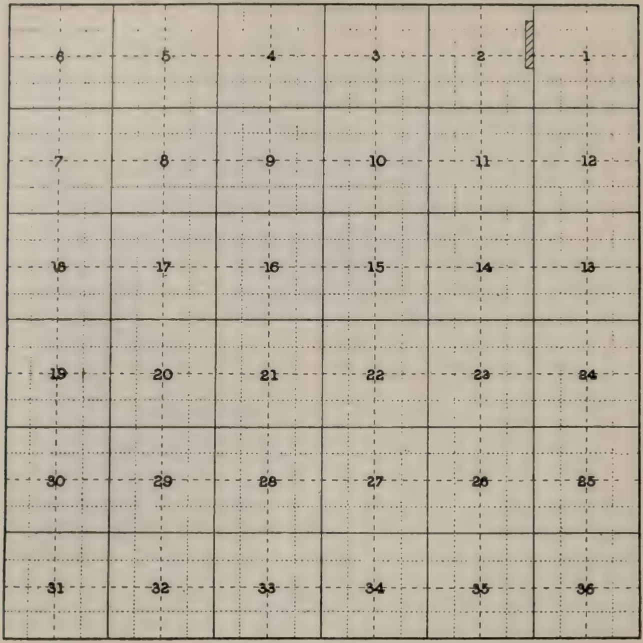
T. 20 S., R. 14 E., M.D.M. — Fresno County.



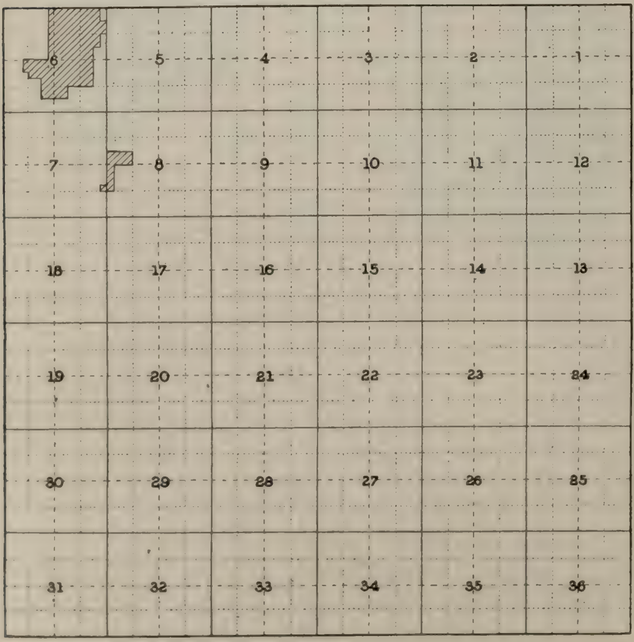
T. 20 S., R. 15 E., M.D. M. — Fresno County



T. 21 S., R. 14 E., M.D.M. — Fresno County.



T. 21 S., R. 15 E., M.D.M. — Fresno County.



The details of the work of the department throughout the state are set forth in the following tabulation:

WORK OF DEPUTIES IN VARIOUS FIELDS.

Deputy, office address, and counties covered	Notices new wells	Decisions					Acres of proved land	Number of producing wells	Logs filed	Graphic logs	Peg model acres
		New wells	Shut-off	Deepen or redrill	Abandon	Total					
M. J. Kirwan, 512 Union League Building, Los Angeles, California. Los Angeles and Orange counties	138	179	256	75	37	547	5,818	1,068	1,243	1,173	10,880
Irving V. Augur, Limoneira Building, Santa Paula, California. Ventura County	49	43	71	34	24	[1]172	1,726	360	550	311	3,200
H. W. Bell, Valley Savings Bank Building, Santa Maria, California. Santa Barbara, San Luis Obispo, Monterey and Santa Clara counties	63	78	143	95	43	359	9,875	362	500	354	7,200
R. N. Ferguson, State Mining Bureau Building, Taft, California. Kern County	435	579	[2]1,007	438	136	2,160	56,947	4,837	5,094	3,668	13,200
R. D. Bush, State Mining Bureau Building, Coalinga, California. Fresno, Kings and other counties	123	137	208	190	38	573	12,994	1,174	1,415	920	2,150
Totals	808	1,016	1,685	832	278	3,811	87,360	7,801	8,802	6,426	36,630

[1] Forty-nine reports covering supplementary notices not included.
[2] Includes 161 special tests.

By comparing the foregoing figures with those covering the previous year[1] the increase of routine field work and the advance in our engineering investigations are clearly seen.

The amount of routine work of the various kinds increased from 8 to 74 per cent due to increased activity in all the oil fields. The greatest increase is noted in the number of tests witnessed, which reflects the closer touch we have been able to maintain with actual field operations.

The progress of investigations, which must underlie all intelligent decisions, is indicated by the number of graphic logs and the total area covered by peg models. The number of producing wells for which graphic logs have been made is now 82 per cent as against 36 per cent for the previous year.

The acreage of proved land for which peg models have been completed is now 42 per cent as against 15 per cent last year.

LOS ANGELES AND ORANGE COUNTIES.

Operations in Los Angeles and Orange counties have been followed with particular interest during the year because it is principally through the new production from the Montebello and Coyote Hills fields that an otherwise declining state production has been maintained. The report of M. J. Kirwan shows that the oil production of the two counties increased 28,236 barrels per day between June, 1917, and June, 1918. This increase, however, does not represent the total amount of oil contributed by the 76 wells completed during the year, because there was a decline of 11,060 barrels in the production of wells completed before June, 1917. The total average daily production contributed by wells completed during the fiscal year was, therefore, 39,296 barrels. This production came mostly from the Coyote Hills and Montebello fields. These new wells have more than doubled the production from all wells in the two counties.

Although there have been serious water conditions to deal with in recently developed areas, Mr. Kirwan's report shows that the wells completed during the year produced 5.5 per cent water, as compared with 21.6 per cent water for production from all wells completed prior to June, 1917. As shown in the report, three wells, in as many fields, contributed more than half the water for the new wells in those fields. Even including these three wells, for which no responsibility can be assumed by this department, a comparison of water percentages for the old and new production demonstrates the value of properly directed engineering work. Repair work has been started on two of these wells. The third well, situated in the Montebello field, is not only a menace to this new field, but is a serious reflection against operating methods of one of the largest producers in the state.

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[1] Bull. No. 82, Cal. State Min. Bur. p. 121.

The amount of work in the two counties, involved in recommendations and engineering advice to operators, has more than doubled during the past fiscal year. The department has been steadily engaged in the work of assembling all available data on past and present oil well operations as a ground work for future engineering problems and investigations. Graphic logs have been made of 94 per cent of all logs on file. Uniformly drawn graphic logs have been necessary in the construction of peg models for study of underground conditions. Peg models have now been constructed for most of the important areas in Los Angeles and Orange counties. Numerous operators have made use of the models in preparing estimates for drilling programs.

Mr. Kirwan's report shows that there were only two formal complaints filed during the year. One of these complaints was settled in accordance with specifications issued by this department. Settlement of the other complaint awaits developments at a well now drilling.

The Coyote Hills field added 28 new wells to the list of producers during the year. These wells show a high daily average of production and are free from water. A study of underground conditions, made by this department, shows that even the proved portion of the field has not been developed to the full extent of its possibilities. Mr. Kirwan's statement of the conditions under which Murphy-Coyote well No. 44 of the Standard Oil Company was drilled, in accordance with recommendations of this department, illustrates the benefits of engineering study and application. An oil-bearing zone, previously considered nonproductive, was developed. The production, in itself, should be sufficient to bring a profitable return on the investment.

Any operator can profitably afford to follow such methods in determining the nature and number of oil-bearing formations or zones which underlie his property. It is somewhat surprising, in view of the demonstration made at the well referred to, that the company has made no further effort to test the zone. Anything but the development and conservation of the resources of a property to the extent of its economic possibilities is a shortsighted policy on the part of any operator—large or small.

Thirteen wells were completed in the Olinda field during the fiscal year. Most of the development work was carried on by the Union Oil Company and Petroleum Development Company.

A change, by one company in this field, in the method of reporting water produced, shows that the method, quite common throughout the state, of reporting only water in suspension after free water is drained off, gives a statement short of the facts as to the water condition of the well. Due to the pressure of work incident to the drilling and repair of wells, the matter of submitting accurate reports of water and oil produced has not received the attention that it should have received. In analyzing operations in any group of wells, it is just as essential to have accurate records of production as it is to have accurate logs. Large quantities of free water drained from tanks and sumps are frequently not included in the operator's statement of fluid produced by a well. As the work of assembling records and preparing engineering information on underground conditions approaches completion, more attention will be given to this important accounting phase of the work.

A study of underground conditions by engineers of the Petroleum Development Company in this field has already yielded a substantial increase in production and opened the way for further profitable development.

There were no important new developments in the Brea Cañon field during the year. Mr. Kirwan has indicated that there are two groups of wells in this field responsible for almost 90 per cent of the water produced in the entire field. The method of repairing one of the wells of the Birch Oil Company, according to specifications issued by this department, demonstrates the possibility of benefiting the general productive condition of the field through plugging off water and also perforating opposite oil sands heretofore excluded.

There was a small decrease in production in the Puente field during the year. The production shows only a small percentage of water.

A slight addition was made to the proved acreage in the Whittier field. Production records of this field, as to oil and water, show the necessity of certain repair work on old wells. It is also evident that a larger drilling campaign is necessary in order to maintain production.

The advantages of careful prospecting and testing by zones in this field, are pointed out by Mr. Kirwan, giving definite results obtained at a number of wells. His report on the Murphy-Whittier property of the Standard Oil Company gives a thorough analysis of operating conditions in the Whittier field. The report can well serve as a model for other engineers.

There are several productive zones in this field. In order to conserve casing, and at the some time protect upper zones, in deep wells, this department has recommended the use of mud-laden fluid. The use of mud, however, is prescribed for certain definite purposes. It is still necessary for some operators to familiarize themselves with details of the mechanical operations involved in the proper use of the mud-fluid method.

As already stated, the Montebello field has played a very important part, during the past year, in maintaining the production of the state.

In June, 1917, this field was producing 852 barrels of oil per day, and in June, 1918, the production had risen to 16,985 barrels per day. Nearly three-fourths of the present production is from wells of the Standard Oil Company, which drilled the first producing well in the field.

Present indications are that water is going to prove a serious obstacle in the development of the field. In view of the fact that this department has prepared a complete analysis of underground conditions from present available data, for the guidance of operators, it is obvious that the responsibility for the future of this field rests largely upon the operators themselves. The Standard Oil Company has an opportunity to demonstrate whether or not a large operating concern could efficiently protect the oil lands developed by it.

It has long been recognized that one of the most important factors in the protection of any field is stratigraphic uniformity in depths of shutting off water. The Montebello field is not an exception to this condition. Failure to determine accurately the position and productiveness of oil-bearing formations prevents the planning of these necessary uniform operations to control water and obtain maximum production. In view of these conditions, this department has recommended careful testing of formations during drilling.

The results as shown by the drill, and reported by the drillers, are the basis of all engineering study of underground conditions. Nearly nine thousand logs of oil wells on file with this department, the records of drillers' observations, bear sufficient witness to the degree of responsibility of the man who drills the well. In this connection the following testimony, given by certain drillers, with reference to their observations during the drilling of well No. 4, Baldwin, of the Red Star Petroleum Company, in the Montebello field, which, as stated by Mr. Kirwan in his report, was the subject of legal action, is deemed by this department as ample and sufficient evidence in the course pursued:

STATEMENT OF H. J. SANBORN, MADE IN ROOM 515, UNION LEAGUE BUILDING, IN PRESENCE OF R. P. McLAUGHLIN AND M. J. KIRWAN, OF THE STATE MINING BUREAU, AND DEPUTY DISTRICT ATTORNEY GEORGE E. GLOVER, OTHERS PRESENT BEING J. M. SPRAGUE AND J. H. THOMPSON.

J. A. CAMP, Reporter.

Questions by MR. GLOVER:

Q. What is your residence, Mr. Sanborn?

A. 4209½ Stephenson avenue, Los Angeles.

Q. What is your occupation, Mr. Sanborn?

A. Rotary driller.

Q. What company are you working for?

A. I am not working for anybody now. I have been working for the Red Star Petroleum.

Q. How long have you been working for them?

A. Four months and a half.

Q. What particular well were you employed on?

A. Red Star Number 4.

Q. How long have you been working on that well?

A. Twenty-five days.

Q. Who is the foreman of that particular well?

A. T. E. Lloyd.

Q. Whose employ is he directly under—who does he get his orders from?

A. I suppose he gets them from Davis.

Q. You know Davis' initials?

A. A. H.

Q. What is his authority, that is, what capacity did Davis work in?

A. Superintendent.

Q. Who else was working on this well as the same time you were?

A. Mr. Sprague and Mr. Thompson.

Q. You know a man by the name of R. L. Peeler?

A. Yes, sir.

Q. What is his business?

A. I am sure I don't know what capacity he does follow out there. They call the term out there "mud smeller."

Q. Sometimes known as a scout?

A. Yes, sir.

Q. Was he on the job all the time while you were working there?

A. No, he never came on the job. He never got out there.

Q. You did not see or have any conversation with him?

A. None whatever.

Q. Who did you take your orders from?

A. Mr. Lloyd.

Q. Who keeps the log book there?

A. The driller makes out his own report.

Q. When were you instructed to make out those reports?

A. After we left tour, or at the end of our tour.

Q. In other words, when you got off shift?

A. Yes, sir.

Q. You wrote up your log book for any developments during the time you were on duty?

A. Yes, sir.

Q. What instructions, if any, did you receive in regard to making up the log book on this particular well? You receive any particular instructions any different for this well than for any others?

A. He told me that morning he wanted that mud kept as heavy as possible, and he said that Kirwan wanted to save out samples every ten feet, but he did not tell me where or when to start.

Q. Did he ever at any time tell you not to take samples?

A. No, he did not tell me not to.

Q. Never did instruct you at any time to take samples?

A. No.

Q. Did he tell you why he wanted you to keep this mud thick?

A. He said to keep that mud heavy—he did not want any oil to show on the ditch whatever.

Q. You did not thicken the mud did you?

A. We were in shale digging, and the mud keeps getting heavier all the time unless you thin it.

Q. You did not thin it up then, or allowed it to run thick?

A. Yes, sir.

Q. How long did you work with that thick mud?

A. All the time.

Q. During what depth, about?

A. I think he told us to keep the mud thick from 1350 feet, or something like that.

Q. You kept the mud thick from that time on did you?

A. Yes, sir.

Q. How deep did you go in this well?

A. 1512, I think.

Q. Now, did you see any indications of oil during that distance?

A. I certainly did.

Q. Where did you first notice it?

A. About 1396.

Q. What kind of shale were you in at that time?

A. We were in sandy shale.

Q. You ever report that to Mr. Lloyd?

A. No, I did not.

Q. Did he ever say anything to you about any oil indications?

A. Yes, sir, he did.

Q. When was that? What particular depth, do you remember?

A. Along about 1350, I think he said.

Remark by Mr. Glover: Now, Mr. Kirwan, I think if you will go ahead from here, if there are any points you particularly desire to bring out?

Questions by Mr. Kirwan:

Q. What evidence of oil did you have when you first noticed the oil?

A. Saw it around the ditch. The scum came up from the ditch when I first noticed it. That is the only way you can tell.

Q. When you pulled out the tools was there any sandy shale on the tools?

A. Yes, sir.

Q. Did that sandy shale have any evidence of oil in it?

A. I broke a piece open and oil sand inside of it. I laid it upon the bull wheels and Mr. Sprague saw it.

Q. How large a sample of oil sand was in that particular piece of shale?

A. I should think about as big as your thumb, and smelled strong, too.

Q. You actually saw the oil oozing out of the shale that you broke open?

A. I did.

Q. On the 24th you went off tour at a depth of about 1396 feet?

A. Yes, sir.

Q. And on the 25th you came on tour at a depth of about 1456, is that correct?

A. Yes, sir.

Q. And you drilled to what depth?

A. 1496.

Q. During the drilling of the forty feet between these depths, did you notice or note any oil on the ditch or by the tools?

A. It was showing up strong in the ditch, and gas.

Q. Was there any shale brought up by the bit that showed any evidence of oil during the drilling between those depths?

A. There was, because I pulled out, and I found a piece of shale on the bit that indicated oil.

Q. That depth you pulled out was bottom, 1496?

A. Yes, sir.

Q. Did you save that sample of shale?

A. I am not sure.

Q. Did you ever save any samples of this well or turn them over to anybody that you remember of?

A. No.

Q. Who else worked on the well in addition to yourself, who were your helpers? What were their names?

A. Jones, the derrick man; Henry Sinclair, Harry Wolf and Bob Johnson.

Q. Did any of those men see the oil, so far as you know, coming from the well or the rotary bit?

A. They noticed the same as I did.

Q. Which one in particular?

A. They all did.

Q. Did any or all of them see the sample you obtained from the bit, at the depth of about 1396?

A. Yes, sir.

Q. Was there any discussion among the men as to the evidence of oil in this sample from the rotary bit?

A. Well, I broke it open and showed it to them. I don't know whether any of them smelled it or not. I think Mr. Sinclair did.

Q. Did they make any remarks to you whether it was a good showing or a poor showing?

A. He thought it was a good showing on the bit.

Q. Who in particular made that statement, and, if you remember, what statement did he make?

A. I think Jones was out there, the derrick man, and he said he thought it a good showing of oil.

Q. That was at a depth of about 1396?

A. Yes, sir.

Q. Were any of the officials of the company, such as Davis or Lloyd, present at this well at any time when oil was showing on the bit?

A. I don't believe they were.

By MR. GLOVER:

Q. Any conversation between you and Mr. Lloyd that you do anything about the showing of oil, anything other than you have already stated?

A. No.

Q. Now, Mr. Sanborn, in making out your reports, did you note these indications of oil that you found?

A. No.

Q. Why didn't you?

A. I didn't think we had to from the instructions we had about keeping the mud heavy.

Q. In other words, you understood, by reason of the fact that you had been instructed to make the mud heavy, that they did not want anything to show up on the log in regard to any oil at that depth?

A. Yes, sir.

Q. Was Mr. Lloyd always on tour while you were there?

A. Not always.

Q. In the event of his absence, did you ever get any orders from anyone else?

A. I can not say that I did. (Signed) H. J. SANBORN.

STATEMENT OF J. H. THOMPSON, MADE IN ROOM 515, UNION LEAGUE BUILDING, JULY 2, 1918, TO R. P. McLAUGHLIN AND M. J. KIRWAN, OF THE STATE MINING BUREAU, AND DEPUTY DISTRICT ATTORNEY GEORGE E. GLOVER, RE RED STAR PETROLEUM COMPANY WELL, RED STAR NO. 4.

J. A. CAMP, Reporter.

Q. By MR. GLOVER: What is your address?

A. 901 Doris street, Los Angeles, California.

Q. What is your occupation?

A. Rotary driller.

Q. By whom are you employed?

A. I was employed by the Red Star Petroleum Company.

Q. When did you quit working for them?

A. The 24th of June, 1918.

Q. What well were you working on at that time?

A. Red Star No. 4.

Q. Who else was working on the well at the same time?

A. Mr. Sanborn and Mr. Sprague.

Q. During your tour who was assisting you?

A. My helpers were Clayton Jordan, Frank Yaeger, Paul Robinson, and a fellow by the name of Charlie Jacobs.

Q. Who did you work under, who was your foreman?

A. Tom Lloyd.

Q. Did you receive any instructions directly from him?

A. Not always directly from him, no sir.

Q. In case he was not on your tour at any time, how did you get your orders?

A. I generally got my orders from the driller I relieved. He would leave word with this driller what he wanted me to do, or what action he wanted me to take and this driller would tell me.

Q. What driller did you always relieve?

A. I always relieved Mr. Sprague on this particular well.

Q. Did you ever get any instructions from Mr. Lloyd or Mr. Sprague in regard to making up the log or report on this well?

A. No, sir.

Q. Did you ever see any indication of oil, say from the depth of 1396 feet on down?

A. Yes, sir.

Q. What were the indications?

A. The indications were on the ditch as to oil floating on the surface of the ditch, on the top of the mud, oil and gas showing both.

Q. Whose tour was it that this oil was first discovered on, if you know?

A. I don't know what tour it was first discovered on—I think it was first discovered on Mr. Sanborn's tour.

Q. When did you first learn that there had been any oil discovered by anyone?

A. You mean what date, or what depth, or both?

Q. What depth?

A. As well as I remember, it was about 1456—that was the depth at the time I heard about the oil being seen on the night before. Mr. Sanborn told me about it.

Q. You remember what he said to you at that time?

A. He made the remark that he got a piece of shale off of the bit the previous night when he pulled out, and that there was quite a nice showing of oil seen in this shale.

Q. Did you make any report in your log of this oil?

A. I did not.

Q. Why didn't you?

A. I did not think such a report was wanted. Mr. Lloyd has always given me to understand that he did not want any oil showing, to show on the ditch, so I naturally supposed from that he did not want it to go in on the log.

Q. You say he had given you to understand, what do you mean by that? What made you think he did not want any showing?

A. He told me that he didn't.

Q. What did he say?

A. He said that he wanted me to carry the mud heavy and prevent any showing of oil or gas if we possibly could; that the water commission was watching that well pretty close, and they did not want it to show up at all.

Q. You remember what date he told you this?

A. I don't remember the date. It was when we were around 1300 or 1350, or something like that.

Q. Therefore you never made any report of any oil or gas?

A. No, sir.

Q. Was Mr. Lloyd ever present when there was any showing of gas on the bit?

A. Not on my particular tour, no.

Q. Ever any discussion on your tour between you and your helpers as to any oil showing?

A. There was on the next to the last tour that I run. Mr. Jordan went out on the ditch and discovered quite a showing of oil and gas, and in holding his hand on the ditch his hand would become covered with oil, and he would catch quite a few particles of oil sand in his hand.

Q. Did he call your attention to that?

A. Yes, sir.

Q. What did he say?

A. He came into the rig where I was and made the remark that we had a fine showing of oil there and he held his hand up and showed me where it was all covered with oil from dipping it into the ditch.

Q. You made out a report of that run did you, after that?

A. I made out a report of that run. I did not report the oil.

Q. For the same reason that you have already stated?

A. Yes, sir, because I did not suppose they cared to have any report of it.

Q. Had you ever received any instructions from the company at any time, either directly or indirectly, not to report these showings?

A. Well I had indirectly, yes, sir, not on this well, but on the former well that I worked on.

Q. What well was that?

A. The Tri-City well.

Q. Who did you receive the instructions from at that time?

A. E. L. Smith.

Q. Who was E. L. Smith, and what authority did he have?

A. I don't know that he had any authority, he was the driller that I relieved. He was drilling the tour from eight to four, and I asked him whether or not they reported oil and gas showings, and told him that I had had a slight showing of oil and gas on this well, and he said no, they did not generally report it, because they had got into several mix-ups by reporting it, and they did not do so now, making no report on the log. That is all the orders I had at any time as to whether to report them or not to report them.

Q. And you were working for the same company at that time?

A. No, that was the Pan-American Petroleum—it was under the same management.

Q. You say that you are not in the employ of the company at the present time?

A. No, sir.

Q. When did you quit?

A. Discharged on the 25th of June.

Q. And why were you discharged?

A. All the reason I could get for being discharged was because I had not taken any samples on this Red Star 4. I had never received any orders to take samples. Mr. Lloyd admitted as much to me.

Q. You say "admitted"—that might be conclusive. What did he say?

A. I don't know that I could say word for word. I asked him whether or not he had issued me any orders. He said no, he issued them to Harry and to Johnnie.

Q. You never received any orders from Johnnie or Harry?

A. The nearest to an order that I received, Mr. Sprague told me we were going to have to save samples every ten feet, but I do not recall that he said where or when.

Q. Never told you at what particular point to commence taking them?

A. Not to the best of my memory, no, sir.

Q. When you say "Harry or Johnnie" who do you mean?

A. Harry Sanborn and Johnnie Sprague.

Q. You know R. L. Peeler?

A. Yes, sir.

Q. By whom was he employed?

A. I guess he was employed by the same outfit that I was.

Q. Did you see him at any time there at the well on your tour?

A. Once, yes, sir.

Q. When was that, do you know?

A. I think it was in the neighborhood of 1400 feet. I don't know the exact depth.

Q. Have any conversation with him in regard to any oil showing?

A. I talked with him, but there was nothing said about the oil showing.

Q. What was the conversation?

A. I asked him whether or not they had discovered any oil in the Tri-City well.

Q. What did he say?

A. That they had not.

Q. Did you ever have any instructions or orders to work in connection with him in regard to the oil?

A. No, sir.

Q. Or any indications that you found of oil there?

A. No, sir.

Q. What were his particular duties at the well, do you know?

A. I don't know. My understanding was that he was supposed to be a geologist for this company. That was simply through hearing the other drillers talk. They called him the "mud smeller." I don't know what his official capacity was.

Q. Did he ever at any time ask you in regard to any indications you found on this well?

A. No, sir.

Q. Now you were on tour at 1436?

A. I went on tour when the well was that depth, yes, sir.

Q. How far did you drill?

A. Twenty feet, to 1455.

Q. During that tour did you see any indications of oil?

A. Why, yes, there were indications of oil in the last two tours that I run there.

Q. What particular indications were there between 1436 and 1456, if you remember?

A. The same indications that I formerly stated. Oil on the surface of the ditch and gas showing.

Q. Did you have any instructions in regard to the thickness of the mud, how it was to run?

A. Yes, sir.

Q. Who did you get your instructions from in regard to that?

A. Mr. Lloyd.

Q. And what were his instructions?

A. His instructions were for me to have the mud, he said to have that mud so thick I would have to help it around the ditch in order to keep that oil from showing on the ditch.

Q. And you did keep the mud thick?

A. I did for a while, and it was so thick I could not make any progress with the bit, so I thinned it up, and Mr. Lloyd the next day sent word through Mr. Sprague for me to keep the mud thick, not to thin it.

Q. When you thickened the mud up, it retards drilling considerably, doesn't it?

A. Yes, sir, it does, in shale digging it does.

Q. And in following the orders received by you, therefore, you would considerably retard drilling operations?

A. Yes, sir, in the particular digging I was in at the time, it would.

Q. In drilling a well in shale of that nature, is there any necessity for making the mud thick in order to prevent caving, or anything of that kind?

A. Absolutely not, it will make mud thicker than you can pump it out by digging in it.

Q. Is there any necessity at any time in drilling to keep the mud thick in this particular well?

A. Not from the depth that I took it on down, I found no occasion where it would be necessary. The well never showed any signs of doing anything but standing up to the best of shape all the time that I was on it.

Q. What depth were you when you started drilling this well?

A. As near as I remember, we were about 600 feet.

Q. And the formation was such it would stand up in good shape from that on down, was it?

A. Yes, sir, I did not pass through anything that would not stand up in good shape.

Q. You never had any trouble with caving at any time, and no occasion to thicken the mud to prevent caving?

A. No. I think as good proof as you could get is the fact that we twisted off before we thickened this mud and it sat there for 12 hours.

Q. How deep was the hole then?

A. As near as I remember it was in the neighborhood of 1000 feet, and if the well was caving at that time we would have had difficulty in pulling this pipe out after we got hold of it, after it sat there for twelve hours.

Q. And the mud was running thin at this time?

A. Yes, sir, the mud was in pretty good shape then.

Q. Just what do you mean when you use the expression "twisted off."

A. Just exactly what I said—the pipe twists in two.

Q. When you were ordered by Mr. Lloyd to thicken the mud to prevent oil showing, was any reason given to you why the oil showing was undesirable?

A. Yes, sir.

Q. What was that reason?

A. The reason he gave me was that the water commission was watching this well pretty closely, and they did not want the water commission to see any oil showing on the ditch. They wanted it to go through this sand without having to stop there.

Q. You were discharged from this well on what date, Mr. Thompson?

A. The 25th.

Q. At what time?

A. Four o'clock in the afternoon.

Q. Who told you that you were discharged?

A. T. E. Lloyd. He did not tell me I was fired. I asked him whether I was fired, or what was the matter. He said no, I don't want to fire any of you boys for the simple fact that you might at some time want to work for this company again, either here in the United States or in Mexico, and he said that if the records showed that we were fired, it would be a difficult thing for us to obtain a position, ''but'' he says, ''I advised the other two boys to quit, and told them where I thought they might get a job,'' and when I asked him what his idea was in letting us out he said it was because we had not saved out samples, and that he felt no other man could put us on any other well and get by with it. I asked him then if the water commission was running this *outfit*, and he said they were pretty near it.

Remark by MR. MCLAUGHLIN:

Q. He told you you were fired because you did not keep samples?

A. Yes, sir.

Q. Were you told by Mr. Lloyd that the state officers had been influential in having you discharged?

A. No, I can not say that I was told by him that you were. He left me, and I think the other boys, under that impression that it was through the state commission that we were going to be discharged. That was my understanding of it.

Remark by MR. GLOVER:

Q. Had you seen anything of Mr. Kirwan or the commissioners the day you were fired?

A. No, sir, I asked to see them, they were at the office at the time, and I asked to see the commissioner who was the cause of it, and Mr. Lloyd said he was being made the goat of, and he was the man that was having to do the discharging.

Q. That is, you mean they were at the office of the Red Star Company at that time?

A. Yes, sir.

Q. But you did not have any conversation with the state officers at at that time?

A. No, sir.

Q. Neither one of them ever send any word to you men while you were employed on the well?

A. No, sir.

Remarks by MR. MCLAUGHLIN:

Q. Did Mr. Lloyd ever tell you that the company had had any trouble at any other well with the state officers?

A. Yes, sir, he mentioned two other wells, if I remember right—I think one was the Darlington, and the other was the Prugh one.

Q. Did he say on account of this former trouble the company was taking any particular steps in its dealings with the state officers at this particular well?

A. Yes, sir, he said that the company was beating the case on one of these other wells—I forget which one he said—but that owing to the fact that the water commission was losing out in the other suit it would be particularly anxious to catch us up on this Red Star 4, and that was his reason for having the mud so thick that the oil would not show up, so to avoid you people being able to catch them up on this well.

(Signed) J. H. Thompson.

STATEMENT OF J. M. SPRAGUE, MADE IN ROOM 515, UNION LEAGUE BUILDING, JULY 2, 1918, TO R. P. McLAUGHLIN AND M. J. KIRWAN, OF THE STATE MINING BUREAU, AND DEPUTY DISTRICT ATTORNEY GEORGE E. GLOVER, RE RED STAR NO. 4.

J. A. Camp, Reporter.

By Mr. Glover:

Q. What is your address?

A. 3558 Sabina street, Los Angeles.

Q. What is your occupation?

A. I am like these fellows, I am not employed. I was a well driller.

Q. Where were you last employed?

A. Red Star Petroleum.

Q. When did you quit working for that company?

A. The 25th of June.

Q. What well were you working on at the time?

A. Red Star No. 4.

Q. Who was your boss or foreman there?

A. Tom Lloyd.

Q. Were you employed on that well from the time it was started?

A. Yes, sir.

Q. At any time did you observe any indications of oil on any of your tours?

A. I did.

Q. When did you first observe that?

A. I would have to look up that log. It must have been 1400 or 1410.

Q. Where were you, at what depth then, when you first noticed the oil indications?

A. It must have been between 1400 and 1410.

Q. Who had you relieved at that time when you went on tour?

A. Mr. Sanborn.

Q. Anything said by Mr. Sanborn at that time in regard to oil showing?

A. Nothing more than he told me there was gas showing up.

Q. Mr. Sanborn stated to you that there was gas showing at that time?

A. Yes, sir.

Q. You remember any other conversation in regard to any oil or any gas?

A. I don't believe I do.

Q. Did not receive any instructions from Mr. Lloyd in regard to making a report of oil or gas on this particular well?

A. No.

Q. Had you ever received any instructions from Mr. Lloyd or anyone else, that is, any other officers of the company, in regard to keeping a record of other wells that you had put down?

A. I had orders on Red Star No. 3 not to report oil showings.

Q. Who gave you those instructions?

A. Lloyd.

Remarks by MR. MCLAUGHLIN: Is Red Star No. 3 in the same field as this well?

A. Yes, sir, same lease.

By MR. GLOVER:

How far, Mr. Sprague, is No. 3 and No. 4?

A. I don't know, about 2000 feet.

Q. What well had you worked on last, before you were working on No. 4?

A. I think it was the Hellman.

Q. What instructions did you receive from anyone in regard to reporting oil or gas showings?

A. We never did look for any there. Never expected any. Never did find any.

Q. Well now, what indications did you see of oil on this first tour of yours that you discovered oil?

A. It showed up on the ditch.

Q. What did you do in regard to it?

A. I never did anything in particular.

Q. Did you have any conversation with Lloyd in regard to it?

A. Well, he came into the rig one morning and saw this oil on the ditch and he says to me, 'It is showing up oil this morning,' and I says, 'Yes,' and then he had taken the boys out and had them dip it off the top with a bucket and throw it away.

Q. Who did that?

A. His name was Denver Crosby.

Q. You know where Denver Crosby is?

A. I think he is still working for the company.

Q. Now Mr. Lloyd did not give you any instructions at this time or any other time to take any samples?

A. No.

Q. What further instructions, if any, did Mr. Lloyd give you at that time in regard to this oil showing?

A. He had us pump more heavy mud into the well.

Q. What did he say in regard to pumping the mud in there?

A. He wanted to make it show heavy so that the oil would not show up any.

Q. Any further instructions in regard to skimming this oil off?

A. I had orders to keep it skimmed off.

Q. From Mr. Lloyd?

A. Yes, sir.

Q. Was it necessary to skim it off more than once during your tour?

A. If you wanted to dispose of it, it was.

Q. Did you actually skim it or have it skimmed more than once while you were on your tour?

A. Yes, sir, as much as three times.

Q. Who did the skimming each time?

A. I think two or three of them had a hand in it once.

Q. And who were they?

A. Lots of them fellows, I don't know their names.

Q. Were any of them your helpers who helped you skim the oil off two or three times?

A. Yes, sir.

Q. Now, at any time while you were drilling there did you find the rotary broken down when you were on duty?

A. I did.

Q. At what depth?

A. About 1400 feet.

Q. Did you proceed to fix up the drill at that time?

A. Yes, sir, after waiting on repairs, we got it fixed up about 2 o'clock.

Q. Did you take the drill out immediately?

A. The drill was out at the time.

Q. Was there any unnecessary delay in fixing the tools to continue drilling?

A. No more than waiting for repairs. I asked Lloyd about this gas showing—that was showing up that morning—and I says, 'If we go back and gas shows again, the water commissioners will be around—it is about time for them, and he said, 'I rather you would not get it started and have them see it.'

Q. Then did you go ahead with it on your shifts?

A. Yes, sir, then I got started to drilling.

Q. But you did lay off for a time, did you not?

A. Not any more than it would take to repair the rotary. There were no water commissioners there then.

Q. When you say "water commissioners," whom do you refer to?

A. The State Mining officials.

Q. They are commonly referred to by the drillers as the water commissioners, are they?

A. Yes, sir.

Remark by MR. MCLAUGHLIN:

Q. Upon what date were you discharged, Mr. Sprague?

A. The 25th of June.

Q. Who told you that you were discharged?

A. They didn't tell me I was discharged.

Q. How did you come to quit?

A. They told us to.

Q. Who told you to?

A. Tom Lloyd.

Q. What reason did he give for telling you to quit work?

A. He said they were having trouble because there were no samples saved.

Q. Did he make any statement to you that the state officials had been influential in having you discharged?

A. Not in my presence he didn't.

Q. Did he make any statement indicating that he could no longer use your services at any well?

A. I think he did, I don't remember what they were.

Q. Did you receive your final pay?

A. Yes, sir.

Q. By whom were you told to get your pay?

A. By Mr. Lloyd.

By Mr. Glover:

Q. What did he say at that time, in regard to further employment?

A. He advised us to look some place else for work.

Q. At any time while you were working on this Red Star No. 4, did Mr. Lloyd or anyone else give you any instructions to keep any samples?

A. Not that I remember of. Mr. Peeler did.

Q. When was that?

A. It was when we were about 1200 feet deep.

Q. Did Mr. Peeler instruct you to take samples?

A. No, he said that Kirwan wanted samples.

Q. When did Mr. Peeler have this conversation with you?

A. When we were about 1200 feet deep.

Q. What conversation did you have with him in regard to taking samples at that time?

A. He just said Mr. Kirwan wanted samples, and we could keep a sample there and send one in.

Q. What position, if any, did Mr. Peeler hold with the company?

A. I don't know. I suppose what they called 'Mud smeller.'

Remarks by Mr. McLaughlin:

Q. Were you ever informed by any official of the company as to the connection of Mr. Peeler with the company?

A. No.

Q. Were you ever instructed to take orders from Mr. Peeler?

A. No.

Q. Were you ever instructed to confer with Mr. Peeler about drilling operations or samples?

A. Not that I remember of.

Q. How many times during the drilling of this well have you seen Mr. Peeler at the well while you were on tour?

A. Some days he would be around as much as three times, I should judge.

Q. Ordinarily, would he come to the well every day?

A. Most always.

Q. Did he personally inspect the ditch?

A. I could not say about that.

Q. Did he personally question you every day about the formations you were passing through?

A. Once in a while he would.

Q. Did he do it every day?

A. No.

Q. Did he, in your presence, question anybody else on those points?

A. Not that I know anything of.

John Sprague (Signed).

Mr. Kirwan's analysis of conditions in the Montebello field and history of development should have the careful study of all operators interested in the development of this field. He notes that, with few exceptions, water was shut off above the first oil-bearing formations penetrated.

VENTURA COUNTY.

Increased activity in this county and expectation of still further increase of oil production caused the department to establish an office at Santa Paula during the past year.

It will be noted that our preliminary engineering work has been carried well along towards completion, notwithstanding the fact that the fields are small and widely separated.

The county appears to offer further opportunities for new developments and the small size of the fields may specially attract small operators. Some of the fields, particularly Piru, Ojai, and Ventura, are producing water in such quantities as to reduce profits to the operators.

Developments in the field near the town of Ventura are extremely promising, but water conditions are a most serious obstacle. The department has had some difficulty in impressing the necessity for systematic work, and there are wells which now menace the field. However, the fact is now more generally recognized that the water absolutely must be controlled if the field is to become a profitable producer, and better work may be expected in the future. In this field the department has made a special effort to rely on advisory supervision on account of the fact but little is yet known of underground conditions.

The construction of peg models by the department has been responsible for the discovery of many underground conditions which were not previously known. This information has already been of immediate assistance to operators in several instances and will be of still greater value in the future. Descriptions of the various fields by Mr. Augur set forth some of these details which merit the careful attention of interested parties particularly on the Montebello dome.

The completion of shallow productive wells near the Ventura River, several miles west of Sulphur Mountain, is an example of the fact that old prospecting work has not fully developed the county, and that detailed geological studies will be profitable.

SANTA BARBARA AND SAN LUIS OBISPO COUNTIES.

The underlying engineering work for the Santa Maria, Casmalia, Cat Canyon, and Lompoc fields has reached far along towards the point where systematic repairs and development can proceed. About 80 per cent of the proved acreage is now covered by peg models.

When the department entered these fields three years ago it was found that, although the fields had been operating some ten years, practically no detailed and systematic study had been made of the underground conditions. In view of the fact that the major portion of the "old field" is under control of the Union Oil Company of California, and that water production is far above the limit found justifiable by other operators in the state, it would seem reasonable to expect that the company will soon adopt modern methods of coping with an unprofitable situation. The operators in the new Casmalia field have already started on such a course.

In general a hearty spirit of co-operation has maintained between the operators of these fields and the department.

It is worthy of note that large sums of money have been expended on wildcat operations which might reasonably have been avoided.

A substantial increase in production from the small Arroyo Grande field occurred during the year.

New operations in the Casmalia field are among the prominent features of the year's work. It will be seen, in Mr. Bell's detailed report, that water conditions are serious and that the department has taken active steps in guiding development and repair work which has recently been undertaken by the operators. Another year should show profitable results *providing* the operators continue systematic and co-operative efforts. This locality is an excellent example of the fact that even the latest and most approved mechanical methods of shutting off water avail but little unless guided by geological and engineering study. The detailed report on these conditions should prove valuable to progressive operators in other fields.

The Cat Canyon field progressed but little during the past year, and adverse water conditions were encountered. Recent developments in this locality are an example of results following scant use of geological and engineering knowledge. It will be noted that possibilities of future profitable development still exist.

The Lompoc field saw no new development during the past year, although there appears to be ample margin for new wells in the proved area. The field is controlled by the Union Oil Company of California. Water is not being properly excluded from the oil-bearing formations.

In the Santa Maria field proper, sometimes referred to as the "old field," important results have followed the drilling of the second zone of oil-bearing formations. The new second zone production is thus far free from water and geological conditions are so favorable that only reasonable care would seem necessary to preserve the present status. This is an important discovery in view of the fact that flooding of this zone at various other places led to the assumption that it was irreparably ruined.

New drilling into the third zone has developed the fact that an "intermediate" water-bearing formation exists. Previous failure to identify the nature and position of this water-bearing formation possibly accounts for much trouble developed in the past. Extreme care will be necessary in future work.

The Sargent field, in Santa Clara County, is the farthest north of all producing fields of the state. The field is small. One new well was drilled during the year.

KERN COUNTY.

The Kern County oil field operations constitute the major portion of the activities of the state. When the department entered these fields three years ago it found some of the most aggravated water troubles existing in California. It also found that little or no systematic and detailed study of underground conditions had ever been made.

The present report shows the degree to which the necessary fundamental investigations have been pursued. Graphic logs for about 75 per cent of the producing wells have been made, as against 26 per cent a year ago. Peg models now cover 23 per cent of the proved area as compared with 12 per cent last year.

But few completed reports on flooded areas have been made, as shown by Mr. Ferguson's report, due to the fact that we had to first gather all the underlying facts. The next year will undoubtedly furnish a number of completed reports with conclusions and recommendations for repairs and developments.

Routine field work increased in all branches except that due to new wells. The largest increase was in the witnessing of tests, which amounted to 60 per cent. Special tests to the number of 161 were witnessed. These tests cover such operations as plugging and mudding new wells and were witnessed for the purpose of affording the utmost security possible. It is probable that, even with this extra effort, many operations were completed in a manner not up to the best practice developed and proved in other localities. Pressure of work has prevented summarizing the results obtained from unusual operations such as mudding[1] and we are, therefore, not yet prepared to make definite statements as to the efficacy of the process.

In the case where the supervisor's order was reversed by the district commissioners (p. 413) subsequent developments indicate that the conclusions of the order were correct[2]. Aside from damage and loss at the particular locality involved, it is hoped that this case will demonstrate that an operator's own interest will best be served by entrusting engineering problems to an engineering organization rather than to a legal staff.

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[1] Bull. No. 82, Cal. State Min. Bur. p. 43.

[2] See note, p. 450, *post*.

The Sunset field presents some of the most complicated underground conditions existing in California. The field has in recent years also witnessed some of the most ill-advised development operations which will require extensive revision and repair.

The Belridge field has, during the past year, furnished an excellent example of the value of careful and systematic prospecting work.

While the Kern River field has not yet seen very extensive repairing of its extensive and widely known water troubles, it is worthy of special note that the largest operator has undertaken detailed engineering investigation. This department has continually urged such proceedure.

In the Midway and McKittrick fields it will be noted, by Mr. Ferguson's report, that the number of complaints filed by the operators has fallen off. On the other hand, joint requests for investigation have been filed. As previously stated this department can not make recommendations until all the facts are assembled.

FRESNO COUNTY.

The operators in the Coalinga field were the first in the state to recognize the necessity of systematically drilling and repairing wells so as to avoid water trouble and secure the utmost production.[1]

The result of the early use of methods now followed and enlarged by this department is shown by the relatively small amount of water now handled. An understanding, on the part of the most of the Coalinga operators, of the value of engineering work, has made it possible for the department to readily co-operate with them in the manner referred to in Mr. Bush's report. It has also been possible to prove or disprove many assumptions as to underground conditions which are of general economic importance in planning the operations of any oil field.

The oil industry must look forward to the necessity of putting forth every effort to determine the existence of loss either of time, labor, or material, so that such loss can be reduced. It will be noted that our report covering the Coalinga field this year summarizes the amount of time lost due to idleness of completed wells. It is believed that no such figures have ever before been assembled and as the system may be perfected throughout the state, a basis of comparison may be established. In view of the fact that from 10 to 20 per cent of the possible pumping time is being lost it will be seen that the item is imporant.

The individual instances cited by Mr. Bush show that even in a field where systematic principles are extensively applied new problems are constantly arising for careful study and supervision.

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[1] Bull. No. 73. Cal. State Min. Bur. p. 30.

DEMONSTRATIONS OF USE OF MUD-LADEN FLUID IN OIL WELL OPERATIONS.

On March 11, 1918, a meeting was held in Los Angeles, for the purpose of discussing the possibilities of the use of mud-laden fluid in oil well operations. The meeting was called by the California State Mining Bureau and was attended by representatives of the Mining Bureau and various California oil companies.

Mr. Fletcher Hamilton, State Mineralogist, presided at the meeting and announced the program. The following is a transcript of the proceedings:

MR. MCLAUGHLIN, State Oil and Gas Supervisor: Gentlemen: As the announcement has been made, this meeting is particularly to discuss the possibilities of the use of mud. It is unnecessary to call to your attention at this time that casing is not the most plentiful thing in the world. This subject of using mud came to our attention shortly after the department was organized and we immediately took it up and made some investigations which your attention was called to in our first report. A number of operators, we thought, would see the possibilities of the thing. We were disappointed in that—in fact there has been only a few operators who have undertaken to carry on an experiment and an experiment of any kind must be carried on under conditions which we control so that you can draw conclusions when you got through. We proposed that a certain number of wells should be drilled in clean territory and then give time to see whether or not this mud shut off was effective. Now, we have been particularly fortunate in having the co-operation of the Shell Company in the Coalinga field, which has drilled some wells, and their geologist, Mr. Nolan, in conjunction with Mr. Bush, of this department, have summarized descriptions of this work and Mr. Nolan has kindly consented to read the results of that work. After he has read these results, the matter will be taken up for discussion.

DEMONSTRATED VALUE OF MUD FLUID IN PROTECTING OIL SANDS.

By E. D. NOLAN, Shell Company of California.

By means of a test well in Section 27, T. 19 S., R. 15 E., of the East-side field at Coalinga, the Shell Company has proven thus far that rotary drilling effectively seals up oil and water sands.

In this portion of the field there are the usual top water sands with large volume and considerable head, then below them upper oil sands then an intermediate water and finally the rich lower oil sands.

In the past it had been necessary to cement a string of casing above the upper oil sands to exclude top water, then cement a second string below the intermediate water and use a third string to drill into the oil sands.

The Shell Company wished to save this extra string of casing, and particularly to save the time necessary to land it. Under the oil conditions which have prevailed during the past year, the need of getting a well to producing as soon as possible is obvious.

A conference was held with the State Mining Bureau and the general scheme planned for drilling a test well.

The well known as No. 90, Section 27, was placed 150′ up the dip from Well No. 78 which had been producing from the upper sands for some time. Water should appear in No. 78 in a short time if the rotary did not protect these upper oil sands.

Well No. 90 on 27 was spudded on September 10, 1917. Drilled to 1631′ by the rotary and upper oil and water sands mudded while passing through them.

Mud was thickened when top of upper oil sands was reached.

Hole was mudded up as fast as it was drilled.

No additional head was put on the mud. The hydraulic head was sufficient.

Red mud was circulated for five days after drilling ceased. The hole took practically none during this period.

The 10″ casing was then cemented at 1631′ with 200 sacks.

The hole is a 15½″ hole with 5′ of 14″ hole at bottom where the 10″ casing is landed. The 200 sacks should therefore extend up the hole about 300′ or above the top of the upper oil sand and is a further guarantee that the sands are protected.

Production of Well No. 78 before and during the period when Well No. 90 was drilling is as follows:

Month	Oil. bbls.	Water. bbls.	Water in suspension	Gravity
Prior to drilling No. 90—				
July	1,138	88	1.7	26.2
August	1,111	77	0.6	26.3
Drilling started on September 10th—				
September	1,017	101	0.2	26.3
October	1,043	95	0.5	26.4
November	1,035	77	*	26.2
December	1,046	83	*	27.0
January	974	70	*	27.0
February	988	51	*	27.1

*Centrifuge tests unavailable.

Pumper reported that muddy water appeared in Well No. 78 during time Well No. 90 was drilling through upper oil sands. This report could not be verified to our satisfaction. The slight increase of water during September and October makes it seem likely that some mud-laden fluid did come through. The water did not increase and this proves the above method of drilling a complete success.

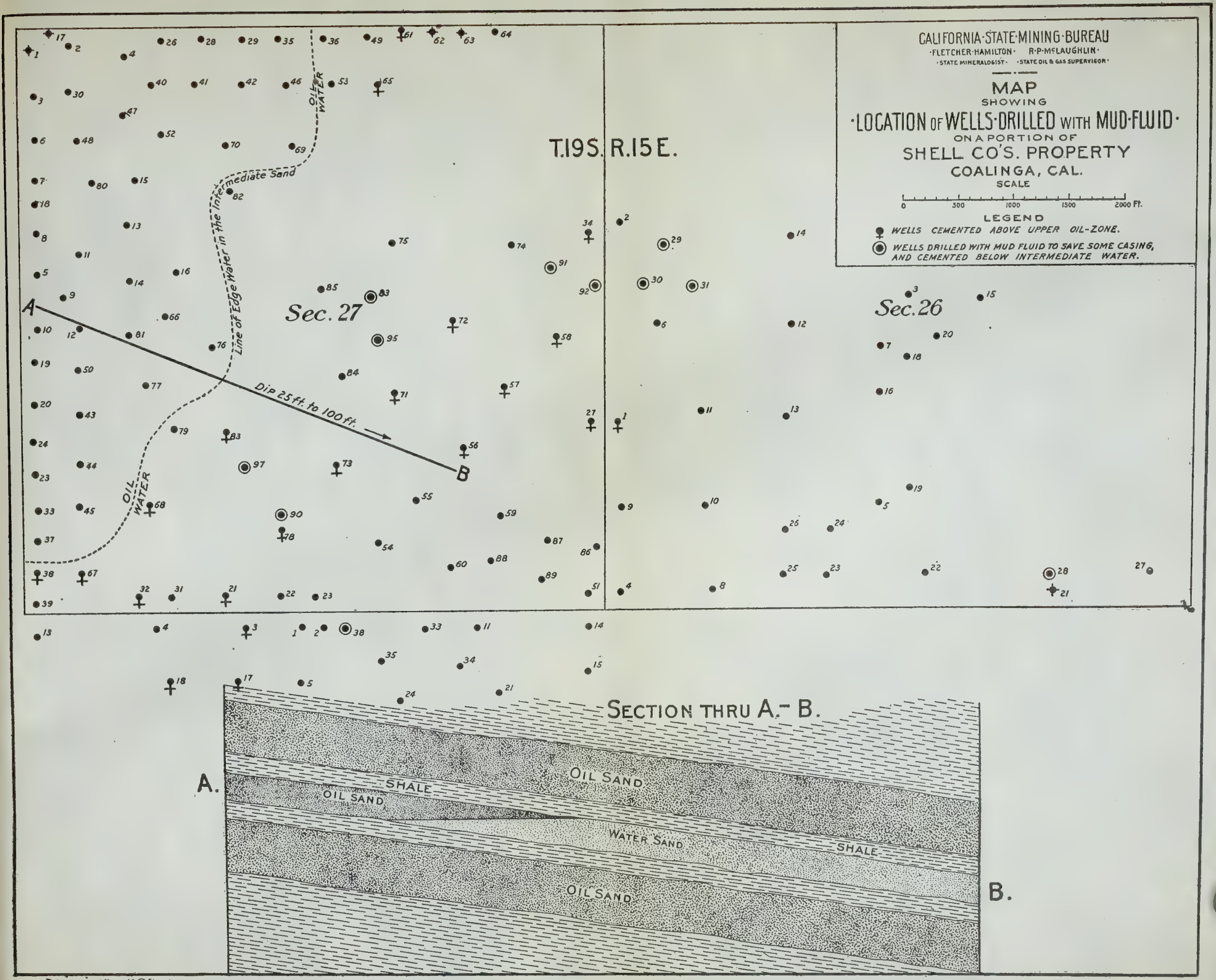

CALIFORNIA·STATE·MINING·BUREAU
·FLETCHER·HAMILTON· R·P·McLAUGHLIN·
·STATE MINERALOGIST· ·STATE OIL & GAS SUPERVISOR·
MAP
SHOWING
·LOCATION OF WELLS·DRILLED WITH MUD·FLUID·
ON A PORTION OF
SHELL CO'S. PROPERTY
COALINGA, CAL.
SCALE
0
500
1000
1500
2000 Ft.
LEGEND
WELLS CEMENTED ABOVE UPPER OIL-ZONE.
WELLS DRILLED WITH MUD FLUID TO SAVE SOME CASING, AND CEMENTED BELOW INTERMEDIATE WATER.
T.19S. R.15E.
Sec. 27
Sec. 26
OIL
WATER
Line of Edge Water in the Intermediate Sand
A
B
Dip 25 ft. to 100 ft.
SECTION THRU A.- B.
A.
B.
SHALE
OIL SAND
OIL SAND
WATER SAND
SHALE
OIL SAND

Fig. 3.

Since the completion of No. 90 on Section 27 the Shell Company has drilled a number of other wells by the same method and with the same object in view.

From these wells they deduced the following general conditions:

1. No conductor pipe is needed as it is not necessary to put on additional head over the hydraulic head of the fluid.
2. Hole is mudded almost instantly as rotary passes them. Fast drilling and rapid circulation are the means of accomplishing this.
3. Rapid rotation is conducive to effective mudding by contact with sides of hole and consequent tendency to force mud into the formations and by causing the solid particles to seek the side of the hole due to the centrifugal force.
4. We circulate the hole from one to three days after the proper depth has been reached. However, we have found that at this stage some holes will take no mud at all, some will take a little, and that none of them will take any mud after twenty-four hours.
5. Circulation can only be regained within three or four hours, and casing will freeze tight in this time. This we believe shows a distinct settlement and tendency of the mud to solidify.
6. The casing is cemented with 200 or more sacks by the Perkins process. This should force cement above the top of the highest oil sands.
7. Cement will set fairly hard even when mixed with 50 per cent mud and a mixture up to 30 per cent affects the strength very little. This we know from a number of laboratory tests. We therefore need have no fear of the cement not setting in a rotary hole.
8. A number of gravity and viscosity tests have been made on the drilling mud used on these wells.

The muds range from 5 to 10 per cent heavier than water. The 10 per cent mud is about as heavy as can be used for drilling.

The viscosity of the muds from blue clay of the above weights range from 2.3 to 3.5. These viscosities were obtained in a regular Engler viscosometer.

Mud from red clay seems to have a lower viscosity for the same weight.

Centrifuge tests show the mud to range *2 to 4 per cent sand and 5 to 8 per cent solid clay.* These samples are taken from the mud pit after settling, when it is ready to be pumped back into the well.

Only a few samples have been taken of mud as it comes from the well, but these show considerably more sand; some as high as 13 per cent. These tests indicate that the settling canal does the work expected of it.

CONCLUSIONS.

By R. D. Bush, California State Mining Bureau.

Nine other wells in this vicinity, shown on the map with double circles, have since been drilled in the same manner, and the wells shown with a "cross," located to the east of the line of edge-water, are those which have been cemented *above* the upper oil zone and which are exposed to the infiltration of water at the mudded wells, should it develop that the work was improperly done. Of the wells cemented above the upper zone, some were drilled entirely through the lower zone and did not encounter the intermediate water, indicating that the water probably occurs in lenses of sand.

The character of the oil sands in this part of the field is such that water does not readily travel through them. The oil is comparatively light in gravity, about 20 degrees. The oil sands are hard and compact as shown in the drilling and by the fact that the wells produce very little sand, if any. Wells in this part of the Coalinga field have been known to stand or be in the process of redrilling or plugging with a large head of water on the oil sands for two and three years without affecting producing wells 300′ and 400′ away. For this reason it is the writer's opinion that it would be necessary to change the specifications of the mudding process used by the Shell Company in order to meet different conditions in other parts of the Coalinga field and in other fields of the state, where sands are more porous, or there is artesian water, or high pressure oil and gas to contend with.

MR. NOLAN: I might say, in this connection, that the Shell Company has recently abandoned two different wells by the mudding process in this portion of the field and another one, No. 14 in Section 14, which is in the north end of the east-side field. This well, No. 14, took a great amount of mud, over 40 tons and all under pressure of less than 200 lbs., in 30 ft. sand, and, in fact, mud appeared in a well 400 ft. away in three days after mud was forced in; although under practically nothing but the hydraulic pressure of the mud. This shows that the sand up there is certainly very porous. On the other hand, Well No. 62, Sec. 27, abandoned in this portion of the field in 500′ of sand and shale, after the well produced for about 5 or 6 years, took a very small amount of mud, although the pressure went up to about 200 lbs. This would certainly seem to check up the investigations made by the State Mining Bureau..

MR. MCLAUGHLIN: Gentlemen: That sums up the facts of the case. In order to forestall any misunderstanding, I want to particularly call attention to the fact that the conditions in that part of the state are not exactly the same as they are in some other portions even of the Coalinga field and that that is a demonstration of the success in one particular locality. The idea of the meeting is to have a discussion of these papers as we go along and anyone who has any question to ask of Mr. Nolan or Mr. Bush, may do so.

MR. POLLARD: It seems to me that the first thing we ought to discuss and ascertain and have everybody understand, would be the action of the mud-fluid in a well. For the first time since I have been handling the mud-fluid for the purpose described here this morning, have I ever heard as clear and concise an idea of what the mud-fluid did in a well as Mr. Nolan of the Shell Company read this morning, but yet I feel that the majority of the drillers and operators are still in the dark as to the real action of the mud-fluid in the ground, and I know, through having had experience in traveling over the entire United States and in the employ of the Federal Government, that it is not understood, and I believe that, as a starting point and to get the men to understand where we are, we ought to first of all discuss what the action of the fluid is in the ground. This, as I say, has been somewhat clear in the paper just read, but yet it is not clear to those who have not made a deep study of this question, and it is one of the most vital questions that there is, in my opinion, in the petroleum industry, and I feel I would like some of the bureau men to tell us what their opinion is as to the action of the mud-fluid in certain territory toward the walling up and the prohibiting of one formation contaminating and mixing with the other, and I believe that a discussion along that line, first of all, would enable us to get a clearer and more concise idea of what we have met here for this morning.

Mr. McLaughlin: I think that these suggestions of Mr. Pollard's are very apt. I will put forth some idea of the elementary principles of this and I hope Mr. Pollard will correct me on any point. The theory of the mud-laden fluid is that the water is carrying in suspension fine mud entirely free from sand. Filters in cyanide plants at gold mines, for instance, are of canvas, and there is a vacuum created on one side which causes the liquids to go through the canvas and strains the slime out and deposits it on the canvas. When this cake is built up to the extent of about three-quarters of an inch, the filter becomes impervious and they have to clean that canvas off by reversing the current of air and blow the slime off. It is reasonable to assume that, when mud or mud-laden fluid, slime, is passing through a sand, whether it is a water or oil bearing sand or anything that has an opening, that the clay will be deposited the same as it is under all conditions that we have observed; therefore, the clay would be forced out from a well to a considerable distance, sometimes greater, sometimes less. Now it is well to bear in mind that it is a different action that you will have when mudding up a well with a rotary. Now bearing in mind how a filter is actually observed to close, I think you will get a conception of what the mud-laden fluid is. I would like to have Mr. Pollard expand on these remarks, if that answers the question, at all, that you have in mind, Mr. Pollard.

Mr. Pollard: It answers it in a way, Mr. McLaughlin, but still I don't believe it goes deep enough yet. I don't believe that the thing has been thoroughly thrashed out so we can know what to expect. In order for the meeting to get the idea, and the younger ones coming in, they may come to a point where they could throw more light on it than us older men who have had the thing in charge. I feel I would like to get to the blackboard and just give a little sketch as to what happens. Lots of times the men will say, "How do you know?" There are certain things we do know while there are some things we do not know. The action of the mud-laden fluid is of such a character now that we know more about it than at any other time. I have studied the action of the mud fluid for 12 years in America and Europe. I believe that one of the most important things that we have in the business is the action of the mud-fluid, and if it is the wish of the meeting I would be pleased to draw a little sketch and show my idea of its action and just what happens.

MR. MCLAUGHLIN: Just take the board, Mr. Pollard, I would be glad to have you.

MR. POLLARD: The filtering process that Mr. McLaughlin spoke of is a very good one. It is one that I use myself and use it all the time, but it does not explain all of what happens in a well. We have to take into consideration, with the filtering process, the pressure on the sands that we are treating, and the pressure has more to do with it than the filtering effect; and so that, in order to get a clear conception of that principle, I will take you back to the time when we used to test our boilers with the cold water test. We will take a boiler with a $\frac{3}{8}$-inch sheet or even greater. We will fill that boiler with cold water, then we would take a low-down pump, and pump more water into that boiler until it had obtained a pressure of three to four hundred pounds. When the pressure was on we would look around and tap the boiler with a hammer until the water would stand on the outside of the boiler in drops as big as your thumb-nail, forced through the boiler sheet by pump pressure.

Now, that is a serious proposition in a well. We are dealing with a pressure of a 1000 to 1500 pounds to the square inch. What will that do under those conditions in the ground? Many drillers and operators are of the opinion that the mud-fluid simply walls up the face of a well. I have read from supposedly noted petroleum engineers that the walling up of a well consists of putting mud-fluid into the well and the drillings in returning to the surface are plastered up on the side of the well with the mud-fluid, caused by the wabbling of the drill stem, no mention being made of the penetrating effect of the mud-fluid back into the formation. This penetrating effect that I speak of, is one of the most important in excluding water or gas, sealing it into its own formation. It is this same penetrating effect of the mud-fluid that becomes dangerous and sometimes is detrimental, inasmuch as it will load up an oil or gas sand in a manner that will spoil the production of wells adjacent to the well that is being treated. I have had analyzed some of the rock from the west side where the mud-fluid has been in the well, and we have found that the high pressure employed, combating the gas pressure had really driven the mud-fluid into the rock, and you could obtain a tremendous amount of the fluid congealed and right into the pores of the hard shell, showing that the pressure was something enormous. I am satisfied that the pressure we put up with the pump did the work. Now then, if the well was 2000 or 3000 ft. deep and we add a pump pressure of 500 lbs. or even greater, it is equal to deepening the well so much more in depth. In order to get a conception of that we will just draw a few formations here (pointing to the blackboard and diagram thereon) this representing the stratified conditions of the ground drilled through. This is a shale; this is rock, and this is sand, and so on down. Now then, when the well has gone through these formations and the mud pressure is on, regardless of what the specific gravity or what the fluid is, there must necessarily be an outlet of the fluid. In representing that, we would say that the outside edge of the fluid as it penetrates into the formation would be in this shape, (see Fig. 4). Shale we know would not take as much fluid as sand would, and rock would be less impervious, hence would not take much fluid, so that in treating a section through the formation under discussion we would draw a line more or less (illustrating on the backboard) in this manner. In some parts of the well the formation could be represented as back from the bore hole fifty to seventy-five feet, and in some cases even greater, so that we have an irregular line (as described on the blackboard) which would give some idea as to the filtering effect of the mud-fluid in the various formations.

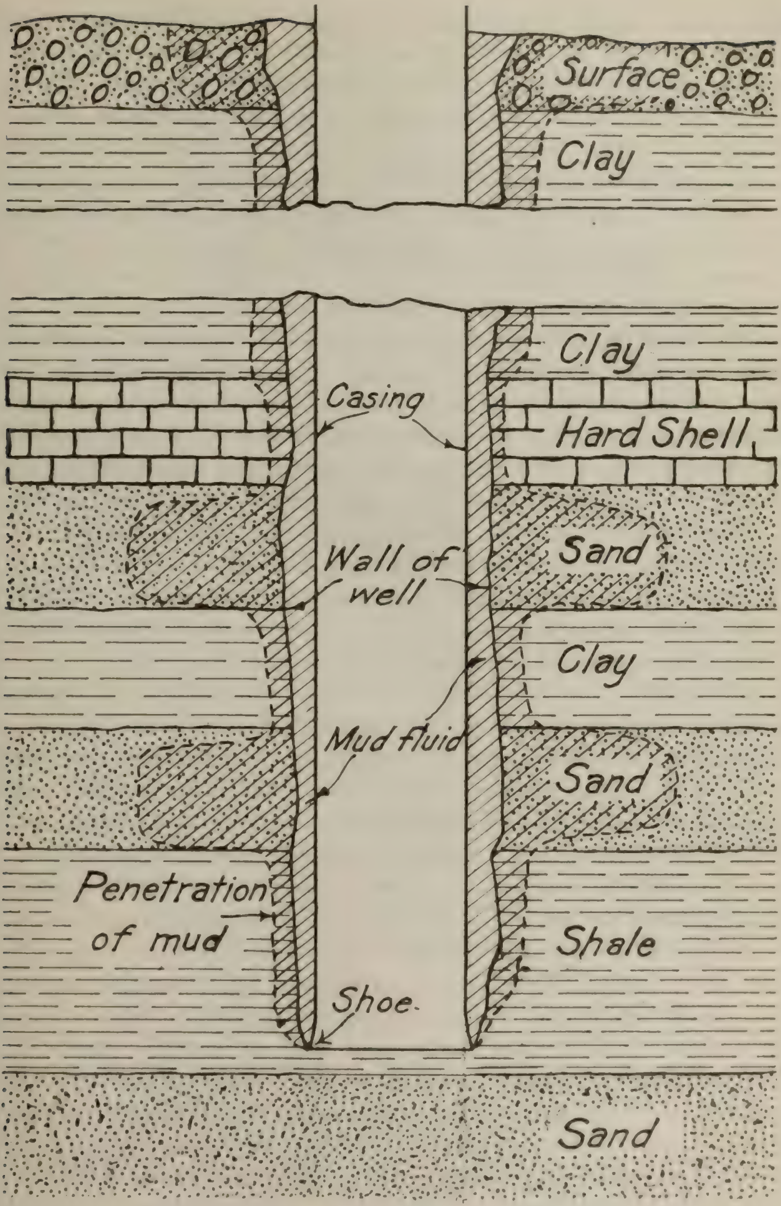
Now then, we have conditions where I have pumped as much as three carloads of mud into a well. When I started this in the California fields I was laughed at and called a crank for using mud in this way. However, in sixty days after I did this I could see two or three carloads of mud come down from San Francisco Bay for other people who could not obtain results, which shows me conclusively that the men who are using the mud-fluid described in the last paper were not particular enough. It is an impossibility to expect the fluid to penetrate the sand you are dealing with and shut off gas and water, with so much sand in it, as described in the last paper.

Since we know that the mud-fluid will travel, as it does in sands,—and we know it by the wells that have been stopped pumping by the fact of an adjacent well having been treated with the mud-fluid system—it behooves us to know just what the action is because if we let the indiscriminate use of this mud system go on, we are going to spoil this territory and undo all the good that the government expected us to do and lose the production of the field which we see is opening, so that the situation we have is one of the biggest things we have ever been up against before in our lives. If we attempt to save too much pipe we are going to undo the good that the government wants us to do. It is one of the most serious things we have to contend with, and we had far better use some pipe than to undo any of the good. The conditions that prevail in California are different from anything else that we have ever had. We have conditions in the Midway fields, California, which should be treated differently from anything else, especially when we consider the cost of drilling a well and the value of the territory.

MR. McLAUGHLIN: I want to thank Mr. Pollard for his remarks, and I want to say that I agree with him that we can not at present issue a blanket approval of mud-laden fluid in all cases. If anybody else has any remarks, I would be very glad to hear them.

MR. I. W. FUQUA: Mr. Chairman, in connection with the problem of mud-laden fluid, it has always seemed to me to be, strictly speaking, the most scientific way of mudding off either water, gas, or oil-bearing formations that are apparently beyond the hopes of satisfactorily cementing off, through and by use of the regular methods of applying a cement for the purpose of excluding water from formations containing oil, and we have two instances in the Coalinga field, which have proven conclusively and to our entire satisfaction that mud-laden fluid can be made, if properly handled and mixed, and applied, to accomplish almost any desired results, and while our work can not be commented upon as being first class in character, nevertheless our intentions were good and we did the best we could under the circumstances, and believe that in a great many of the most serious and the most difficult of jobs, they could be handled most satisfactorily if the consistency of the mud is carefully prepared, forced in under whatever pressure that may be desired, and continue the process as long as it may be necessary, and I believe that greater results can be accomplished than have heretofore been effected, and prevent in a good many cases the shooting off of casing in a horizon or zone where a condition of this kind would only complicate matters and prevent the final completion and accomplishment of the task that was at first undertaken.

Our Well No. 8, Section 19-20-15, we were satisfied was more or less of a trouble maker in the way of allowing water to pass down from behind the one-time cemented casing and into the oil sand, and into other wells to the south, which were being considerably interfered with in their production of oil. In this well we had a great deal of casing trouble. As a matter of fact, it was in bad shape, and after considering the matter from every angle we decided that the mudding process would be the most logical solution of our difficulty. Mud was pumped in of various consistencies and under various pressures, from running it into the hole up to 200 pounds per square inch. This process was continued until such time as the well refused to take any more fluid, and immediately thereafter we observed an appreciable decline in the amount of water and a perceptible increase in the production of oil in adjoining wells



Sketch Showing
PENETRATION OF MUD FLUID
in various formations
By
JOHN A. POLLARD

FIG. 1.

to the south. Roughly speaking, in Well No. 7, which was approximately 350 feet south, in May, 1917, the oil production was only three barrels per day, the water running from 90 per cent to 98 per cent. The mudding off of Well No. 8 was completed in the month of July, 1917, and in August Well No. 7 came up in its production of oil to 20 barrels per day, and in December to 22 barrels per day, and in January and February this year 22 and 30 barrels per day, respectively, with an appreciable decline in water. Well No. 6, which was the next one south of Well No. 7, showed a decline in oil from 40 to 45 barrels to 12 barrels during the period when we believed that water was infiltrating into the oil sands in Well No. 8, and in September, 1917, Well No. 6 had increased its production to 20 barrels of oil per day with an appreciable decline in water, and in October the production in oil had risen to 28 barrels. In January this year the well produced 36 barrels of oil per day with a considerable decline in water, and we have reason to believe that there will still be a further decline in the production of water and perhaps a little further increase in oil. The oil sands, however, in this part of the district having been produced from for a number of years, there is not and never will be very much of an increased production. The main point will be to preserve the developed channels, through which the oil has been traveling to the various wells for a number of years, as much as possible so that the flow of the oil to the wells will not be interrupted by foreign substances of any kind, and to prevent, wherever it is possible to do so, the admittance and infiltration of water into the productive oil sands. I am advised that in some of the Eastern fields water is being run into oil-bearing formations for the purpose of chasing out the oil, and I understand that it is highly successful, but I do not believe that we will ever find it necessary to resort to this principle in this particular district in the Coalinga field. I think and believe that plenty of water will get in without having to intentionally break it in.

We have another Well No. 34 on Section 6-20-15, which gave us a great deal of concern and required a great deal of thought and effort before we were able to determine the exact source of the water, which was found later on to be a bottom water. Before this determination was made, however, a plug was placed below the cemented casing and the well was bailed dry, which indicated immediately that the water was coming from some other source, and in continuing our efforts it was finally decided and located in the bottom, after which we mudded up thoroughly and put in a cement bridge on top. The well was making, before the water broke in, approximately 100 barrels per day. After we finished with the mudding process and after the water had stood on the sand for a considerable length of time, we find that the well is now making 75 barrels of oil with about 15 per cent of water.

I regret at this time that I am not able to submit more in detail a thorough, complete and comprehensive report on both of these wells as I have been very busily engaged in other matters, which has prevented their preparation, and as I consider the use of mud-laden fluid a very desirous and scientific way in which to handle a number of our most serious difficulties. I wish to have all of those at this meeting understand me, in that I believe in it wholly and completely.

THE USE OF MUD FLUID IN ABANDONMENT.

By R. D. Bush.

The American Petroleum Company, upon the suggestion of State Oil and Gas Supervisor, R. P. McLaughlin, recently abandoned Well No. 8, Section 19, T. 20 S., R. 15 E., Coalinga field, protecting the oil sands from water by the use of mud-fluid. The work was approved and inspected by this department, and its effectiveness is being demonstrated by the production of surrounding wells.

Abandonment was necessary since mechanical troubles made it doubtful whether the 8¼″ casing could be successfully re-cemented to shut out top water. The 10″ cemented at 1712′ was originally the water string and the well produced for several years from the sands below it. Later, edge water appeared in the upper sands and was shut off with the 8¼″ casing at 1885′.

In preparation for the mudding and abandonment, 1864′ of 5⅝″ and 1826′ of 8¼″ casings were pulled out and the 8¼″ carried to 1980′ and the well cleaned out to 200½′. Mud-fluid was obtained by mixing the surface formation, which was fairly good clay containing a small amount of fine grained sand, with water. A forty horse-power boiler and Gumbo Buster pump were set some 900′ south of the well where the mud was mixed by circulating the fluid through the pump and discharging it through a hose into a 50′ x 75′ shallow reservoir made by plowing the ground and banking up the sides. The sand settled out to a great extent before the fluid reached the suction box at the pump. By adjusting the valves the pump discharged directly into the top of the 8¼″ casing at the well through a 2″ line. The work at this plant was attended to by one man, with occasionally an extra helper, and the work at the well by two drilling crews of two men each.

No figures are available as to the yards of material pumped into the well, but some idea may be gained by an estimate of the time during which mud was being introduced into the well. The total time consumed in mudding, moving casing, plugging, cleaning out, etc., was 46 days of 24 hours and on every day except six mud was pumped into the well a portion of the time, occasionally with the 2″ valve wide open, but generally barely opened, allowing just enough fluid to run in to keep the hole full but not running over, between the 8¼″ and 10″ casings. In that manner the oil sands took all the mud put in, the quantity gradually decreasing, until the hole stood full under the hydrostatic pressure only. A casing head was then put on with packing clamps between the 8¼″ and 10″ casings and more mud pumped in until the pressure was up to 200 pounds and fell only 20 pounds in one hour.

For the first 16 days the 8¼″ casing was kept at 1927′ and the sand at that point mudded first, until it required pump pressure to force mud into the well. The casing was then lowered to 1976′ and the sands below 1990′ mudded in the same manner. Plugs of brick and rope were then put in from 2004′ to 1494′. The casing was then pulled up to 1784′ and the upper sands mudded under pressure.

During the first portion of the work the mud-fluid was rather thin so that the mud would be deposited in the sand voids for a considerable distance from the well, thus building up a body of formation around the well which will be impervious to water. As the sands became clogged with mud, the fluid was thickened and the final column of fluid standing in the well to the surface is of maximum density and its hydrostatic pressure greater than the water in any stratum of sand, and thus will confine all waters to the sands in which they occur.

Evidence that the mud-fluid traveled away from the well when the fluid was thin is had from the fact that muddy water on the fifth day appeared in succession in the production of Wells Nos. 7, 6, and 5, being more pronounced in the nearest one, No. 7, distant 332′ south, and least in No. 5, distance 1000′ south, and discontinued after the fluid was thickened and required pump pressure to force it into Well No. 8.

Careful gauges of Wells 5, 6 and 7 taken during the month of August, 1917, during the mudding, show the following daily averages:

	Bbls. oil	Bbls. water
Well No. 5	13.4	349
Well No. 6	11.6	187
Well No. 7	18.0	227
Totals	43.0	763

Similar gauges taken during February, 1918, six months after completion of the work show the following daily averages:

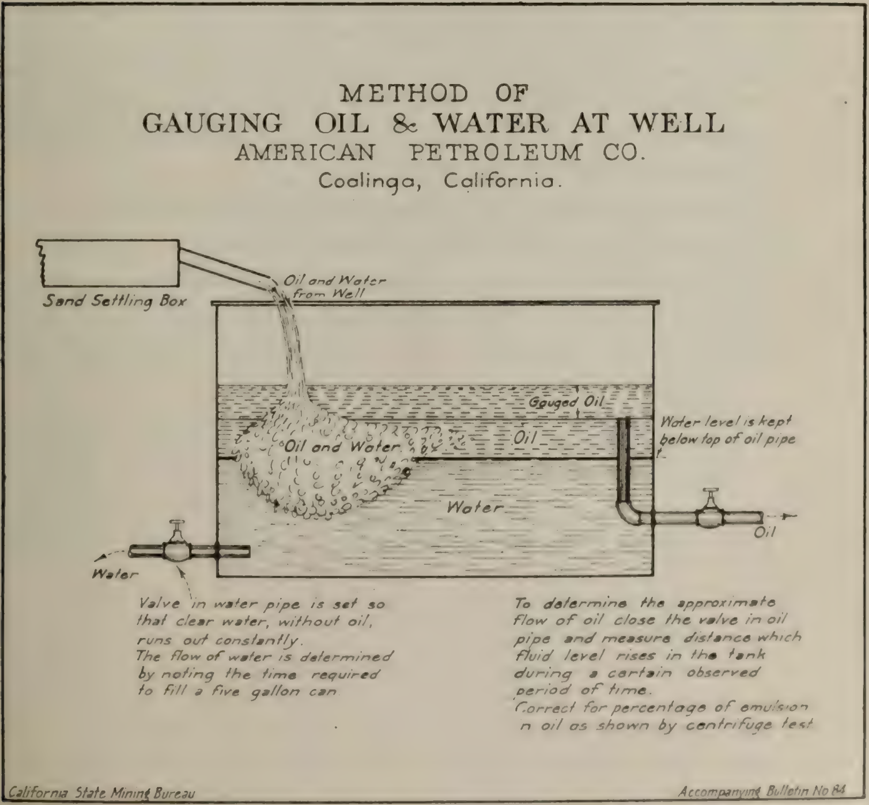
	Bbls. oil	Bbls. water
Well No. 5	23.4	245
Well No. 6	31.1	169
Well No. 7	34.6	156
Totals	89.1	570

This shows a total increase in oil of 46 barrels per day and a total decrease in water of 193 barrels per day. The approximate cost of abandonment at Well 8, given by the American Petroleum Co. was $1,831 for labor, material, oil and water. No credit is given for 1864′ of 6⅝″ and 1826′ of 8¼″ second-hand casings, and taking into account the additional production of oil, a substantial balance on the credit side is shown for the work.

MR. McLAUGHLIN: In connection with that paper I would like to call attention to something that probably might, at first glance, have no bearing on this subject. That's the method in which wells are gauged. I have noticed that there is a very careful system and a very good understanding by the American Petroleum Co. in the Coalinga field in the manner in which they gauge wells. I would like to have either Mr. Crumpton or Mr. Fuqua tell us why they gauge wells and how.

MR. FUQUA: I would suggest that Mr. Crumpton do that.

MR. T. J. CRUMPTON: Mr. McLaughlin asked me to explain why it was necessary to gauge this water and oil in such a manner as I have done. I would like to state now that the reason that I have done this is on account of the department pounding me on the back all the time



Valve in water pipe is set so that clear water, without oil, runs out constantly.
The flow of water is determined by noting the time required to fill a five gallon can

To determine the approximate flow of oil close the valve in oil pipe and measure distance which fluid level rises in the tank during a certain observed period of time.
Correct for percentage of emulsion in oil as shown by centrifuge test

FIG. 5.

for a lot of information that I could not get otherwise. However, I would like to state that, since I have done this in the method that I have, that it affords me enough information and I am very glad that they have forced me to do so. Most of our wells that are making a large amount of water are pumped into a sump and there is a water pipe running from it and an oil pipe running from it. The water pipe is regulated accurately as near as we can tell, by not allowing the water to rise high enough that you can see it in the sump by stirring it with a stick. This water is gauged by a 5-gallon can and we generally take about three or four days' gauges before really getting any accurate figures on the water.

The same way with oil, which is gauged with a 5-gallon can and these figures computed into barrels or gallons, and then a centrifuge cut of this gauged oil is made to determine the actual net oil that comes from the well. Where we have a tank, we have a suction pipe that comes up possibly half way in the tank which drains the oil off the top and the water runs out the bottom as shown in the sketch, (fig. 5.) The valve on the water line is regulated so that the water is drained off at the same rate that it is pumped from the well and is gauged with a 5-gallon can. When the oil is gauged the valve in the oil line is closed and after a certain time the height of the oil above the top of the oil pipe is measured. The well actually gets a little bit the worst of it from the pressure, but, as a matter of fact, where you have lots of water you don't accumulate over 2 or 3 inches of oil, so the hydrostatic pressure does not have much effect on the result.

MUD-FLUID USED BY STANDARD OIL COMPANY.

By R. C. Stoner and C. C. Scharpenberg, Standard Oil Company (California).

Mr. R. C. Stoner: Speaking for the Standard Oil Company, we mudded several wells in the Kern River field and in some we had good success and in some we hadn't. The following is a history of our results of use of mud-fluid:

When the Monte Cristo Properties in the Kern River field were taken over by the Standard Oil Company, several of the wells were making enormous quantities of water. Mud-laden fluid was used in most of the Kern River wells to shut off the water, the following being wells which were worked on and in which mud-laden fluid was used to seal up the sands:

Well No. 6, Monte Cristo No. 2.
Section 32-28-28, Kern River.

This well, because of its greater depth as compared to surrounding wells, was suspected of being drilled into bottom water. We took out the 7⅝″ casing and redrilled the well from 670′ to 985′, mudding hole as we cleaned out; we struck bottom water sand at 976′ and mud went away, afterwards showing up in Four Oil Company's Wells Nos. 3, 7, 8, 10 and 12 to the south and west. We put in a total of 390 yards of clay by mixing with mud mixer and running the mud in through 973′ of 7⅝″ casing until we got circulation; then dumped in 25 sacks of cement from 985′ to 950′, put in burnt wire line bridge against the walls of the hole at 950′ and put in 30 sacks of cement from 950′ to 890′. We then landed 7⅝″ casing at 889′ and perforated it.

Before working on the well it produced 5 barrels of oil and 300 barrels of water; it now produces 10 barrels of oil and practically no water. The effect on the Appolo's and Four Oil Company's wells was as follows:

Production, Four Oil Company, September 10, 1917.

	Before redrilling No. 6		After redrilling No. 6	
	Oil. bbls.	Water. bbls.	Oil. bbls.	Water. bbls.
Well No. 3		500	25	25
Well No. 4		200	15	30
Well No. 5	15	285	40	60
Well No. 6	7	393	20	100
Well No. 7		300	25	25
Well No. 8		500	20	
Well No. 12	10	390	25	11
Totals	32	2,568	170	251

Water in Nos. 4 and 6 decreasing.

Well No. 51, Monte Cristo No. 1,
Section 5-29-28, Kern River.

Well No. 51 had been abandoned by the Monte Cristo Oil Company and in order to shut off the water the well had to be redrilled and top and bottom water both shut off. The hole was redrilled with 12½″ casing to 545′ and cemented with 12½″ casing at this depth with 50 sacks of cement and 20 sacks of hydraulic lime. We then thoroughly mudded formations between the bottom of the 12½″ casing and 720′ with 75 yards of clay, shot cement pocket at 720′, put in bridge and cemented 9⅝″ casing at 720′; on drilling out cement found water shut off. We then carried the 7⅝″ casing to 1014′ and put in 250 yards of clay with mud mixer, applying air pressure of 275 pounds until hole stood full of mud. At this date well is standing full of mud. Before working on Well No. 51, Wells Nos. 26, 32, 40 and 44 were making about 1000 barrels of water and only a coloring of oil. This work shut off 95 per cent of the water in these wells and they are now making production as follows: No. 26, 15 barrels of oil, No. 32, 15 barrels of oil, No. 44, 40 barrels of oil and No. 40 is making no oil or water.

Well No. 13, Monte Cristo No. 1.
Section 5-29-28, Kern River.

This well had been abandoned by the Monte Cristo Oil Company; rigged up to shut off bottom water. Ran in a string of 7⅝″ casing and cleaned out the bottom (1065′). For 30 days we mudded up the formations between 915′ and 1065′, using 600 yards of clay and 35 sacks of sawdust. Pumped mud in under 250 pounds pressure after getting circulation and followed it with 3½ tons of cement. The work of shutting off bottom water in this well was successful and it also shut off the water in Well No. 65. Before working on this abandoned hole, No. 65 was blowing 2000 barrels of water per day and no oil, it now makes 10 barrels of oil and very little water.

In all the work we have done in the old Kern River field, with one exception, to shut off the water, we have used mud to seal up the sands to stop the flow of water preparatory to cementing. The water on the old Monte Cristo property is constantly moving in the sands and this is proved by the sudden rise of water in the wells when some of the big water wells are shut down. Water has also been observed running in a well through a hole in the casing, without filling up the well. With this constantly moving water it is obvious that attempting to cement strings of casing or plugging with cement alone would be of no value.

In one job (Well No. 51) when shutting off bottom water, mud alone was used and forced into the formations under 275 pounds pressure. The 7⅝″ casing was carried to the bottom (1014′) of this well and after thoroughly mudding, the 7⅝″ casing was withdrawn and the hole left full of mud. This well has been standing for one year full of mud.

From the work we have done in this field, it might appear to those not familiar with the Kern River field conditions, that our work would only be of a temporary nature, having been done with such an unstable substance as mud. However, it appears to me that under conditions as they exist in the Kern River field and under similar conditions the use of mud as we have used it in the wells described is entirely feasible.

In deep wells the use of mud does not appear to be so desirable. In case of a Kern River well, which has been mudded, again becoming a channel for flow of water into the oil measures, it is possible to open the old hole and re-seal the formations, in a deep hole it is doubtful whether the well could be successfully re-mudded.

Were it possible to make tests on a well and to re-mud the formations if necessary after the casing had been landed through the mudded formations, it could be kept sealed and the sands would so remain impervious to the flow of water or oil.

In most cases it would be impossible to pump mud behind a string of casing after it had been landed for any length of time. This I believe would be especially so of a long string (3000′) of casing, which had been landed in a rotary hole. It might be possible to pump mud a short distance up behind the shoe or a short distance down from the surface on the outside of the casing, but bridges which would occur due to the caving of the walls of the hole against the pipe would prevent the hole from ever being re-mudded and also render useless, observations as to whether the hole on the outside of the pipe was full of mud.

In the Midway field mud was used under similar conditions but the effect on the surrounding wells was very different.

During the abandonment of Midway Oil Company's Well No. 9, on Section 35–21–24, mud was pumped into the oil and gas sands, the mud showing up in Standard Oil Company's Monarch No. 4 gas well, located about 250′ away, having a very unfavorable effect. Before mudding the Midway Oil Company's well, Monarch No. 4 made about 1,000,000 cubic feet of gas per day and had been making that amount for over a year; after the mudding the well began making mud and now does not make any gas.

Another instance where mud had a deleterious effect was when Eagle Creek No. 21 was to be abandoned. Tubing and rods had been lost in the well and when we proposed to abandon the well we endeavored to seal the oil sands by pumping mud down the hole. This mud went directly into the oil sands and was pumped out of Honolulu No. 12, which is about 600′ away and down the dip of the formations. Honolulu No. 12 decreased in production from 100 barrels to 35 barrels and to date has not come back.

From the use of mud as we have seen it, we have had very favorable results in the Kern River field and very unfavorable results in the Midway field. This is no doubt due to the different conditions of the sands, structure and character of the oil. The use of mud seems to meet with more favorable results when used in shallow wells producing heavy oil than when used in deep wells producing light oil (25° gravity) and gas.

In conclusion I may state that mud has its uses but great care should be taken that low pressure productive oil and gas sands are not sealed up so that they will not unseal themselves, and also, that when mud is used to mud up sands when landing water strings, it seems advisable to follow the mud with cement.

C. C. SCHARPENBERG: Mud has been used in the drilling of oil wells by the rotary system in California for many years, having been introduced here from Eastern fields. It has been found in drilling that mud is necessary for the successful completion of wells through certain sand and shale strata containing water or gas, and the use of drilling tools adapted for working with mud-laden fluid had therefore increased until at the present time such tools are used almost exclusively.

Mud is usually considered to wall up the hole, mixing with the sand or other formations so as to give this material an angle of repose of 90 degrees. This angle of repose will be maintained usually for four to six hours, or perhaps longer, varying with conditions of use and formations, but should a rotary hole be kept full of muddy fluid and left standing indefinitely it has been proved in many cases that a new balancing of pressures will take place, and a lower angle of repose will be established with consequent caving of the walls. It is also known that these cavings form bridges in the hole which are capable of bearing great weights so that often they have to be drilled through with drilling tools, the drilling being harder than in new formations. After such a bridge has been drilled through nothing solid is encountered to the bottom of the hole except perhaps other bridges which may have been formed. Thus it is possible that such a bridge may form, keeping the hole full of mud above the bridge and allowing a void to develop below, which on the new adjustment of pressures would allow an intercommunication of the contents of various strata. Such a condition can readily take place in a hole in which the casing has been landed and much damage done before detection. If other wells in the vicinity have been finished in like manner the difficulty in locating the source of the water until a condition could exist similar to that in the Kern River field. Conditions have been encountered in drilling with mud circulating in which the mud column did not support the surrounding formations and the drill pipe was struck, proving that a balancing column of mud will not support the walls of a hole drilled in the loose formations frequently met with in California.

If the formations can not be held in place, conditions are likely to result which in the course of time will permit entrance of water into strata from which it should be shut out. This leads us to a study of mud and some of its uses in other lines of industry, from which conclusions may be drawn as to its action in our work. Clay is composed of a complex series of aluminum silicates, with iron and other impurities; very little lime is present. If mixed with water the settling is very slow, the finer particles remaining in suspension in a fluid state for years, provided that there is no means of escape for the water. Sand is practically composed of silica, which when mixed with mud forms only a physical mixture. The pumping of mud into sand is the filling of the sand voids by the semifluid-mud; the continued pumping of mud into sand will soon so fill all voids that there is no further travel of mud into the sand. Thus a barrier has been formed similar to a wedge, which will allow no communication so long as an excess of pressure is exerted on its base by a semifluid mass. Should the supporting fluid become clear water, with oil or gas on the other side, there will ultimately be communication through minute channels by capillarity, since the material of which the plug is composed has but little hydraulic value, but is a mass of material held together only by the friction existing between the small particles of which it is composed. At this point the fact that sand and mud have no hydraulic value is to be emphasized; those formations in the earth which separate the different water strata or water from oil and gas are in every case composed of material the deposition of which required a great period of time, or material of more or less hydraulic value was present, and that this deposition was aided by certain colloidal conditions in rendering these strata impervious to water. After the structure is broken as by drilling through it the clay can not be made as impervious as it formerly was. This is proved in the construction of earthen dams as there is always a certain per cent of seepage. In stopping of the seepage at the Austin dam, holes are to be drilled into the porous formation and cement grout forced in under pressure. This above condition is mentioned only to show that in clay placed artificially by capillary action water is transmitted from one side to the other.

In the Kern River field the western extension Sec. 27-28-27, Well No. 3, and all other wells drilied in this vicinity, it was noted that in drilling a 17″ hole with a rotary there is a continual disappearance of mud even while the hole is standing, being kept full of heavy mud especially prepared for this purpose. The shrinkage amounted to about 96 linear feet per day. The cause of this disappearance is that a certain amount of water does seep away into the upper formation and the remaining part of the loss is due to mud being carried away by the water flowing through the water sands.

Another item of interest noted in this well was that while fishing with an overshot it was brought out full of fairly solid mud. This mud appeared to have caved from the wall above as it had attached a layer of sand, thus showing that the supporting of fluid did not counter-balance the formation pressure or give the formation an angle of repose of 90 degrees, but mention must be made that in most cases the sand is held in place better than some shales. In this field special mention can be made of the efforts to shut off water from the oil sands. The following is the procedure now gone through when ready to cement: 12½ casing set in rotary hole, about 100 cubic feet of clear water is pumped in ahead; about 200 cubic feet of hydraulic lime followed by about 250 cubic feet of cement, keeping lime and cement separate by packers in transit through casing. This mud is left back of casing, but no mud could be added outside of the pipe because of the caving of upper formation which takes place. The 10″ casing is landed above the oil sand, the same procedure taking place as described above, except that the gate on the packing head outside of 10″ is closed and cement is forced in to the formation under all the pressure that may be available under the limits of safety. By this means we have ben able to shut off the water, all other means of mud and cement being failures.

The question of pumping clear water into the casing before cementing varies in different places. At the Lost Hills field by experience it was found necessary to introduce a quantity of clear water into the hole to wash the drilling mud away from the formation in order that the water might be shut off with cement, but in other cases this clear water would cause caving of the formation so that cement could not be landed in place.

An interesting example of the use of mud-laden fluid is shown by Well No. 4, Derby, Sec. 16-32-24. Set 10″ casing in formations with long shoe. Had heavy rotary mud back of pipe; stood for a day, started bailing, dumping mud in cellar; bailed to 1600 feet; cellar full of mud; formation gave way at shoe; all mud ran into hole from back of casing, showing that at certain places the formation is not strong enough to bear the weight of fluid back of pipe; and in this case cement should have been used in forming the seal at the bottom of the casing. Another interesting condition arose on this property, viz, Well No. 7. Hole drilled with rotary and full of mud, 12½ casing stuck at 1707 feet. While working at this depth with fishing tools the mud disappeared into the formation. If the above condition should take place in a well having several water or oil strata back of pipe with a caving of the walls of the hole there might be an intercommunication.

On going into new field it is found that very little mud can be pumped away into the formation, but on a decline of oil and gas pressure the sands will take up a great quantity of mud. Such is true of the Kern River field and also at certain places in Midway and Sunset oil fields. In some cases mud introduced into a well finds a path into the oil and gas passages, traveling for considerable distances. Several cases can be cited, viz, mud traveling from Well No. 9, Sec. 35, Midway Oil Co. to Monarch, Sec. 26, Well No. 4; from Well No. 21, Eagle Creek to Well No. 12, Honolulu Oil Co. Also in drilling it is often found that through strata which could formerly be drilled through only with difficulty, now can not be filled up with mud alone, but foreign vegetable matter must be added. This mud forced into low pressure strata often finds its way into other wells, as Sec. 36-21-23, Well No. 20 to Well No. 10, well flowing produced mud and causes considerable trouble. Judicious use of mud has its place and is very valuable to confine and plaster up formations temporarily but if backed by cement permanence and dependence can be shown. Examples can be cited by Wells 7, 10 and 16, Sec. 18-32-24, where water and oil were shut off by cement back of a string of pipe. Later the oil stratum was perforated, no water coming into the hole, one case making a 30 barrel well.

On Sec. 26-31-23, Well No. 6, it would be possible to have eliminated the string of 10″ casing which was landed at 1968 feet, as a string of 12½ had been landed at 1648′ and the 8¼ casing at 2350′. The land about was practically undrilled and there was considerable gas pressure. The gas sands did not take much mud and had it been planned that the water and gas sands be kept separate by mud it would have been necessary to have kept close watch that the mud did not unseal the sands, as other gas wells were drawing from these sands, lowering the pressure and having a tendency to draw large quantities of mud into the hole, if water from the sand above did not also come in. Should a bridge form below the 12½″ casing the water would have had free access to the gas measures.

Every means possible on our part has been done to keep water from the gas sands on this property, but with all that the wells are showing more water as they increase in age.

In conclusion, will state that I believe the surest though somewhat more expensive way of protecting the oil and gas measures, is by far the best.

MR. McDUFFIE: There is one point that I would like to inquire. It seems that both he and Mr. Bush make a particular point that it is necessary to start in circulating with thin mud. I don't quite understand why the conditions of pressure, etc., would not vary just as well with the conditions of formations in abandonment. In a new well it might not be necessary to use thin mud at the start. I would like Mr. Pollard, perhaps he could explain why it is essential.

MR. POLLARD: In regard to using mud of a thinner nature for any particular work, that should be governed by the conditions that prevail. For instance, if a corrosive water is encountered, it is necessary to drive that corrosive water as far away from your well as possible. I am talking now along the lines of underground conservation, something that has been very little talked about in the oil industry at all. Where a corrosive water is encountered, in my mind the fluid should be put into that sand in a thinner nature than what it would under ordinary circumstances, for the reason that we are attempting to exclude that corrosive water and drive it back from the bore-hole as far as possible so that only in a case such as that or of the mudding up to a high pressure gas sand, it is also very good, but outside of those two conditions I don't know of any other condition that would call for thin mud being used, outside of the ordinary tempered mud as used in the ordinary way; but, in using in that manner, we know of instances, and I have instances under observation for a number of years where corrosive water has been excluded from the casing and stopped the water from eating the casing out and causing the redrilling and the wrecking of the field. That is in the Texas fields that I refer to. When the wells have been wrecked, we have pulled the casing and found the mill marks still on the pipe. It is a very serious thing to protect the casing from corrosive water, but aside from the two cases mentioned, I don't know why it should be used in a thinner nature.

MR. STONER: In California it seems to me the sands are not a sandstone, they are a loose sand, but very little cementing material, and a heavy mud would probably be better as far as the California field than a thin mud because a thin mud would be more like water; it would go through most any sand.

Mr. McLaughlin: The Shell Company has been drilling some new wells in Ventura County and they have been using mud for somewhat different purposes that we have here, and I would like to have Mr. McDuffie make some few remarks, if you will, Mr. McDuffie.

Mr. McDuffie: In Ventura we get a flowing water and gas between 50′ of the surface and we have no hard formation whatsoever. Now we find if we did not have the mud very thick, we could not hold it at all. What I wanted to particularly get clear in my own mind was whether it is the individual well or individual territory that determines whether you have to use high pressure, or whether you have to have thick or thin mud. That is, it is impossible to say, is it not, that it is necessary in one certain field to have a certain character of mud and a certain pressure. I was also very much interested in Mr. Pollard's remarks about the amount of sand the mud contains and I was wondering if he could, perhaps, enlighten us on the percentage of sand that is permissible. Assuming that your hole is taking more or less mud constantly and that you are constantly passing through sandy shale, can you sufficiently reduce the percentage of sand to about 2 per cent?

Mr. McLaughlin: If you have any details on that Mr. Pollard, we would like to have them at this time.

Mr. Pollard: I haven't the data here to present as official, but it has been my observation that the less sand that is in the mud, the more effective it will be. In regard to the artesian flow that he spoke of, the reason why he found it necessary, in my opinion, to use the mud so heavy, using the higher specific gravity of mud on that shallow sand helped him out, and if he had attempted to use thin mud in that case he would not have met wtih success: and his remarks in regard to wells being different, it is very seldom that I have ever worked on a well that did not present a different problem. That's where we have to be careful in using the mud-laden fluid in any territory and in any number of wells, because we will find the conditions will be different in most every case. I would like to say further that, in handling mud with a view of taking care of water, that, water in its own formation is not dangerous. It is only dangerous when we let the water get out of its own formation. If the water travels down on the outside of the pipe it becomes dangerous as is the same case when it has power to raise upwards creating a hydrostatic head, which it can not have when held in its own formation. If we can keep the water in its own formation we have repaired that damage we have done to nature by drilling the hole through it, and in this manner have overcome one of the greatest difficulties in preserving the territory, be it gas or oil. When we put casing down on top of the gas we have protected that gas from escaping into adjacent formations, but when we deliberately go through a gas zone with the casing and then perforate it, it is impossible for us to expect to save our gas fields, and that in my mind is where a great deal of the trouble is coming from that we are experiencing in the Midway field today. In producing the gas, we have allowed it to come in contact with the formations, and thereby migrate and seek the point of least resistance and in a very short time our gas has disappeared. This condition is very much the same in regard to water troubles.

I have seen wells cased hundreds of feet above the pay-sand, and then the flow string into the pay, with the water course behind it to conduct the water into the sand whenever it gets ready. As a consequence, when the pressure becomes diminished on the fields the water starts a movement down the outside of the casing and then we wonder where it comes from. However, with it all I believe there is more brain work being displayed in California fields than anywhere else in the world. It is not to be wondered at, since the problems are so vast, that we have the troubles that we do. It is a marvel to me that some of our fields last as long as they do.

Mr. McLaughlin: We have one other paper describing the work in the Salt Lake field. Before that is presented, I would like to say that I am glad to see that we have as good attendance here as we have and I am going to pass this tablet around and I would like to ask you to put your name and address, or the company you are with, and pass it to your neighbor, please:

M. H. Whittier	Los Angeles
Wm. C. McDuffie	343 Sansome St., San Francisco
J. E. Elliott	343 Sansome St., San Francisco
T. E. Comins	404 Security Bldg., Los Angeles
J. H. Purdy, Sec.	Olig Crude Oil Co.
J. J. McClemmons, Supt.	Olig Crude Oil Co.
Lionel T. Barneson	General Petroleum Corp.
F. J. Prehoda	Rancho La Brea Oil Co.
A. H. Liscomb	38 E. Union St., Pasadena
P. W. Garn	Montebello Oil Co., 902 T. I. Bldg.
S. H. Gester	Standard Oil Co.
E. J. Miley	State Cons. Oil Co., Baker-Det. Bldg.
S. C. Graham	Graham-Loftus Oil Co., Security Bldg.
G. M. Swindell, Sec.	Chamber of Mines and Oils
T. M. Frampton	R.F.D. No. 1, Whittier
Robt. N. Bulla	Central Oil Co., H. W. H. Bldg.
C. E. Miller	Natl. Magnesia Mfg. Co., 544 Market St., San Francisco
Cyrus Bell	200 Bush St., San Francisco
P. W. Thompson	Standard Oil Co., Los Alamos
F. F. Hill	Union Oil Co.
D. T. Saine	R. D. No. 1, Box 57, Bakersfield
A. D. Fyfe	Casmalia, Cal.
D. B. Arrell	632 Title Ins. Bldg., Los Angeles
E. D. Nolan	Shell Co., San Francisco
W. S. Smullin	Whittier, Cal.
B. L. Cunningham	1007 S. P. Co. Bldg., San Francisco
F. E. Shafer	1947 Oak St., South Pasadena

B. E. Parsons	Gen. Pet. Corp., Taft, Cal.
F. Chappellet	1003 Higgins Bldg., Los Angeles
C. P. Bowie, Pet. Engr.	U. S. Bureau of Mines, San Francisco
E. G. Gaylord	1007 S. P. Bldg., San Francisco
W. B. Blodgett	A.T.S.F. Fuel Dept., Fellows, Cal.
F. C. Ripley	A.T.S.F. Fuel Dept., Kerckhoff Bldg., Los Angeles
C. C. Scharpenberg	Standard Oil Co., Bakersfield
Ray C. Stoner	Standard Oil Co., Bakersfield
M. E. Lombardi	S. P. Co., 670 S. P. Bldg., San Francisco
L. J. King	Associated Oil Co.
John T. Wooten	Amalgamated Oil Co.
J. Collins	R. D. 2, Fullerton, P. D. Co.
John A. Pollard, Supt.	Highland Div., Compton, Cal.
W. S. Clute	Pet. Midway Co., Ltd.
Henry S. Woolner	208 H. W. Hellman Bldg.
I. W. Fuqua	California Petroleum Corp.
W. J. Travers	Olinda Land Co., Fullerton
S. J. Hardison	Nevada Petr. Co., Coalinga.
F. E. Twitchell, Supt.	Copa de Oro Pet Co., Brea
Lee W. Butler	Copa de Oro Pet. Co., 512 Cal. Bldg.
W. A. Butterworth	Fellows, Cal., American Oil Fields Co.
W. B. Robb	Ind. Oil Producers Co.
T. J. Crumpton	Fellows, Cal.

MR. MCLAUGHLIN: Gentlemen: If you will come to order, Mr. Kirwan will read this paper worked out on the Salt Lake field and then Mr. Prehoda, superintendent of the Rancho La Brea Oil Co., will add some remarks to that.

MR. KIRWAN: This paper has been made for our annual report and we have made a few additions and corrections and possibly it would be well to read the paper and discuss it afterwards.

REPORT ON MUDDING AND CEMENTING OPERATIONS AT RANCHO LA BREA OIL COMPANY WELL NO. 41.*

Sec. 15, T. 1 S., R. 14 W., S. B. B. & M., Salt Lake Field.

Along the line of development of the mudding process for excluding water from oil wells, which process has been used successfully in numerous instances in California, the following mudding operation is described more or less in detail with the idea that other operators confronted with similar problems may profit by the experience of this company in attacking such problems when the more common method of putting in cement plugs has failed.

Rancho La Brea Oil Company Well No. 41 was completed in September, 1911, at a depth of 955 feet, and made an initial production of over 100 barrels of oil per day and no water. The production of this well dropped considerably from the initial production until January 24, 1916, on which date the company filed a proposal to deepen this well and cement a string of casing below the oil sands, in order to protect them from water, which they expected to develop at a depth of about 1800 feet for use on the property.

Water sand was unexpectedly encountered at a depth of 1123′ and

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*See also Chapter III, page 235, *post*.

penetrated to a depth of 1285′. Drilling operations were stopped when this depth was reached and several attempts were made to plug the bottom of the well in order to protect the oil sands from water. Various methods of bridging and cementing were employed by the company and by cement experts, but without success.

Accompanying this article is a cross-section showing certain wells of Rancho La Brea and Salt Lake companies. A map showing the position of wells included in the cross-section is also given, (Fig. 6). Study of this cross-section shows that fairly regular geologic conditions exist in this area of the Salt Lake field. It will be noted that Rancho La Brea well No. 41, shown on the cross-section, has been drilled deeper into the formation than any of the other wells shown. A peg model constructed by this department shows that in general the formations dip in a southwesterly direction from the Rancho La Brea Company property on Section 15 towards the Salt Lake property on Section 22.

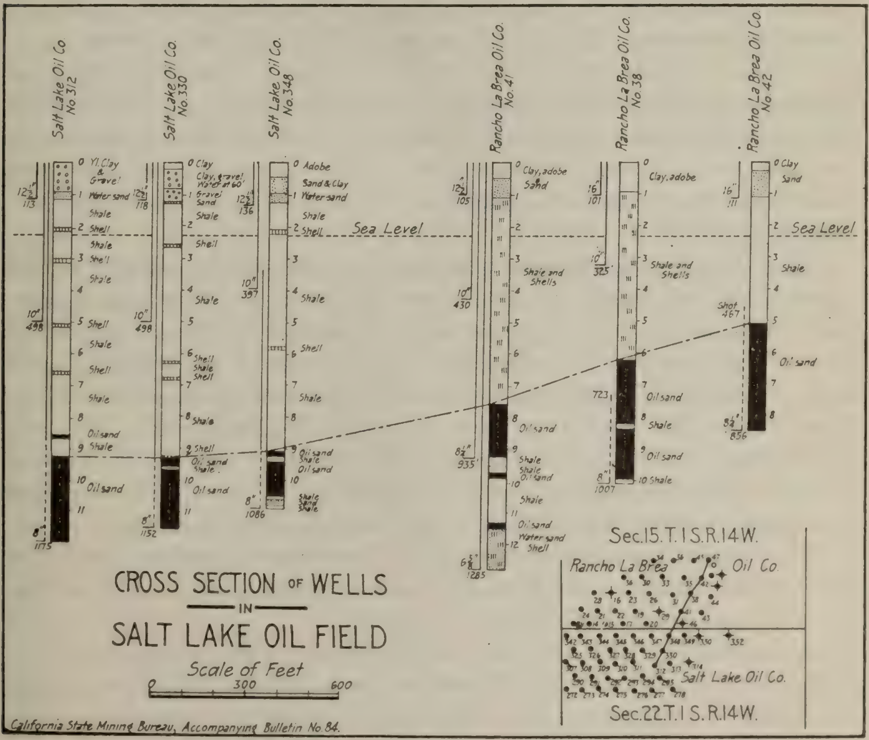

Fig. 6.

In the early part of April, 1917, Mr. George G. Hunt, an official of the Rancho La Brea Oil Company, requested the Deputy Supervisor in charge of the Los Angeles office, to suggest means of shutting off the water in this well. Detailed information regarding the physical condition of the well was requested, and subsequently received from the company. A study of these records and an interview with the field superintendent of this company, Mr. F. J. Prehoda, brought out the fact that cement previously placed in the bottom of the well, was carried back into the formation. This probably accounted for the failure of the various cementing jobs to shut off the water. This department recommended that the company pump mud-laden fluid into the sands near the bottom of the well. Mr. Prehoda, who has had considerable experience in the use of mud-laden fluid, readily agreed to try the experiment, and co-operated with the State Mining Bureau in the matter of eliminating the water trouble which was spreading to adjoining wells on this and neighboring properties.

Previous to the beginning of mudding operations, Mr. Prehoda reported that the well had been bridged from bottom (1285′) up to 1100′, with brick and rocks driven down by the tools. On May 10, 1917, the bridge was drilled out to a depth of 1185′ and mudding operations started. The oil string was set at a depth of about 1100′, and mud about the consistency of rotary mud pumped into the well through three-inch tubing which extended to a depth of 1168′. About 24 hours after mudding operations were started in this well, Salt Lake Oil Co. Wells Nos. 329, 330, 347 and 348 and Rancho La Brea Oil Co. Well No. 38, pumped water carrying considerable mud. Upon request from this department the wells of the Salt Lake Oil Co. producing this mud were shut down.

After mudding operations had been in progress for over a month without any apparent success to mud up the formations, this department suggested that sawdust be used in addition to the mud in order to stop up the pores, or openings, in the formation penetrated by the mud. A favorable effect was immediately noticed in that, shortly afterwards, June 21, circulation was obtained. Following this, the well was thoroughly mudded by forcing mud-laden fluid into the formations under a pump pressure of 400 pounds per square inch. The well was shut down, leaving the mud-laden fluid standing at the surface.

Mr. Prehoda reported to this department that a total of about 700 cubic yards of adobe and 40 cubic yards of sawdust were pumped into the well during the first mudding operation.

On August 1, 1917, the mud was washed out of the well and the well bridged from 1109′ to 1095′ by tamping rock into the formation and the bottom of the well cemented with 50 sacks of cement pumped through tubing, bringing the top of the cement plug up to a depth of 1080′.

After cementing, the well was allowed to stand about three weeks and put on the pump and produced between three and four hundred barrels of clear, salty water per day. No mud used during mudding operations appeared in the well.

About a month after the cementing of Well No. 41, water again broke into Rancho La Brea Well No. 38. Subsequent to water breaking into this well, Rancho La Brea Well No. 41 was mudded a second time. This latter operation was started on November 13, and was finished on December 4. During this second mudding operation, four feet of the cement plug in the bottom of the well were drilled out, five old bull-ropes cut into three-inch lengths mixed with adobe, about 70 yards of adobe and 10 yards of sawdust were pumped into the well under a pressure of about 400 pounds per square inch. During this mudding operation, Rancho La Brea Well No. 38 was shut down. On December 11, when the pumps at Rancho La Brea Well No. 41 were practically ''stalled'' and the well taking only a small amount of mud, Well No. 38 was put on the pump and began to pump muddy water. Well No. 41 immediately began to take more mud. For three days Well No. 38 pumped muddy water and then started to pump a small amount of oil. According to the production report, this well produced 300 barrels of oil and 200 barrels of water during the month of December, 1917, while the mud-fluid stood at the surface in Well No. 41.

The information relative to work done at the first and second mudding operations at this well were furnished this department by Mr. F. J. Prehoda.

Accompanying this report is a statement showing the monthly production of oil and water of Salt Lake Oil Company's Wells Nos. 329, 330, 347 and 348, and Rancho La Brea Oil Company Well No. 38. These wells were directly affected, and produced mud during the initial mudding operation of Rancho La Brea Well No. 41. This table shows that these wells averaged a total of about 500 barrels of oil and 4445 barrels of water during the months of January, February, March, April and May, 1917. This was before Rnacho La Brea Oil Co. Well No. 41 had been mudded up. The table shows that these wells were shut down during June and July. From August to January inclusive, these wells averaged 2259 barrels of oil and 4230 barrels of water per month, showing a net average increase of oil to 1759 barrels per month. This increase of oil is probably due to work done in mudding Rancho La Brea Well No. 41.

It is interesting to note at this time that the well is standing full of mud-laden fluid up to a depth of 140 feet from the surface, and from this depth up to surface, the well stands full of clear water. Previous to mudding operations, fluid stood at a depth of 173 feet and could not be lowered by bailing. The fact that mud-laden fluid and water stands at the level indicated, tends to prove that water is not penetrating the oil-bearing formations at this well. This is rather interesting in view of the fact that this well has been standing undisturbed for a period of about four months.

One factor of great importance in the study of water conditions in the area under discussion, is the presence of large quantities of water in certain wells in the Salt Lake field previous to penetration of "bottom water" in Rancho La Brea Well No. 41. Available figures indicate that Rancho La Brea Well No. 41 was not the cause of the principal water trouble in the adjoining wells. The mudding of this well, however, has bettered the water condition of the adjoining wells, and has resulted in a marked increase in the production of oil.

The main source of the present water trouble affecting wells of the Salt Lake Oil Company mentioned in this report, antedates the deepening of Rancho La Brea Well No. 41, and may possibly come from one of the abandoned wells which may have been improperly plugged.

It is the opinion of the Deputy Supervisor that while water sands in Rancho La Brea Well No. 41 may be mudded up, that the oil sands in this well have also been thoroughly mudded. This department has recommended that the Rancho La Brea Oil Company leave Well No. 41 shut down for a certain period of time. It has also been recommended that the Rancho La Brea Oil Company and the Salt Lake Oil Company gauge the production of certain of their wells located in the vicinity of Rancho La Brea Well No. 41, and furnish this department with the results of these gauges, in order that further study of the water situation in this area may be made.

STATEMENT TAKEN FROM MONTHLY PRODUCTION REPORTS FURNISHED THE STATE MINING BUREAU BY THE RANCHO LA BREA OIL COMPANY AND SALT LAKE OIL COMPANY.

Month		Salt Lake Well No. 329		Salt Lake Well No. 330		Salt Lake Well No. 347		Salt Lake Well No. 348		Rancho La Brea Well No. 38		Totals	
		Bbls. oil	Bbls. water	Bbls. oil	Bbls. water	Bbls. oil	Bbls. water	Bbls. oil	Bbls. water	Bbls. oil	Bbls. water	Bbls. oil	Bbls. water
1917	January	359	49	174	551	235	2,705	------	2,325	*	*	768	5.630
	February	329	45	------	780	212	2,433	------	2,025	*	*	541	5,963
	March	184	122	130	520	179	2,061	123	1,102	†	†	616	3,865
	April	90	510	120	480	240	2,160	123	1,102	†	†	573	4,252
	May	------	375	------	475	------	2,150	------	475	†	†	------	3,475
	June	*	*	*	*	*	*	*	*	†	†	*	*
	July	*	*	*	*	*	*	*	*	†	†	*	*
	August	418	302	494	266	580	420	420	280	†	†	1,912	1,268
	September	630	1,170	720	1,089	265	1,845	760	1,140	†	†	2,315	5,235
	October	720	1,089	700	700	205	1,845	720	1,280	†	†	2,345	4,905
	November	630	770	960	640	180	1,520	713	1,663	*	*	2,483	4,693
	December	630	770	923	616	168	1,512	440	1,760	300	200	2.461	4,858
1918	January	518	632	624	416	180	1,620	384	1,536	330	220	2,036	4,424

*Shut down. †No report.

Mr. Prehoda: In regard to Well No. 41 it was water we were after, being under the impression it was good boiler water. We intended to carry 6⅝ casing to the first shale below the oil sand and land it; but as the oil sand was running in we were unable to tell when the shale had been reached until water had made its appearance. The water was not noticeable until we reached 1190′ then it raised within 170 ft. of the surface. The well was drilled to 1248 ft. then the water tested as to its value for boiler purposes. Finding the water of no value we proceeded to plug the well and shut the water off. I had the well plugged to 1180′ and cemented. After letting it stand three weeks, had it opened to test and found there was no cement; it must have washed away. Then it was plugged up to 1120′ and again cemented it stood for three weeks more, and tested only to find the same results. The well was cleaned out and the 6⅝ casing was allowed to follow, after which we found that shale had been gone through from 1085′ to 1118′. The well was bridged to 1090′ and was cemented. After standing a period of three weeks was tested and found the cement set but the water was not shut off. The well was pumping one month and produced only warm salty water. After consulting Mr. Kirwan we agreed to mud the well in hopes of mudding the passages which we thought were leading from this well to our No. 38 a distance of 500′ away; also the Salt Lake wells which are from 1500′ to 2000′ distant. I had used the mud two days when Mr. Foster informed that his wells on the Salt Lake were pumping mud. After imparting this information to Mr. Kirwan he took the matter up with Mr. Wooten and wells were shut down and mudding started again. About 600 yards of adobe were pumped in, but could not get any circulation. Mr. Kirwan suggested that I get some sawdust and mix it in the mud, which I did, and after using some 25 yards, finally got a circulation ten to fifteen minutes at a time and the fluid would disappear. It continued this way for a week or ten days. Each day the circulation remained longer until the fluid did not leave. I kept circulating for one week and then let the well stand for about one month. Then I consulted Mr. Kirwan and we decided to pump the wells; the Salt Lake was notified and I started No. 38 on our property and it went to making oil the first day and the Salt Lake wells also showed more oil than they had for months before. After four weeks our Well No. 38 went to pumping mud again. I at once went to Well No. 41 and found that the fluid had gone down to the water level of 170′. Put a crew on mudding it again. This time I used bull rope chopped up fine and 8 yards of sawdust and 60 yards of adobe. Had no trouble in getting circulation and I had 400 pounds pressure put on the well after the pumping was started. I had No. 38 started to see if it would have any effect on the pressure and I found that it did. So I had the crew pump in mud for two more days when the pump was stalled again. Then let the well stand four weeks more, when starting it again it pumped muddy water for two days when oil began to appear and in one week was pumping 30 per cent oil and has been improving daily and at this writing is doing 50 per cent oil.

My first experience with mud was November, 1912. I had Mr. Perkins cement Well No. 51 for me. When I went to test the well, found the water was not shut off. We drilled about 20′ further and then cemented the 8¼″. The cement set that time all right, but the water was still there. We couldn't get circulation. I had a hydraulic pump there—2200 pounds pressure on it. I stated that we couldn't get circulation. I then got this mud and a tapering shoe. I drilled the hole ahead, got the mud all ready and I circulated the mud awhile and drove my shoe down into this small hole—I did not wait for it to set—but I bailed it out and let it stand for seven days and the well was just as dead at the end of seven days as it was the first day. From that time I went to using mud.

Mr. Kirwan: What was the depth of that well, Mr. Prehoda?

Mr. Prehoda: On the drilling well? I think it was 1200′.

Mr. Kirwan: Do you think that was a combination of formation shut-off or due to the mud only?

Mr. Prehoda: I think it was a good deal the mud.

Mr. Stoner: From the description of Well No. 41, all the mud you pumped went into the oil sands.

Mr. Prehoda: I had my 6⅝″ down below the oil sands.

Mr. Stoner: It is a question in different areas whether or not the oil would stand that much mud and come back.

Mr. Prehoda: I don't know. I never pumped 41. Forty-one stands today.

Q. The mud you used was all black adobe mud?

A. Yes. All black adobe mud. Every day when we pumped this mud in the well we would first shovel all the sand that accumulated in the bottom of this sump hole out.

Q. How do you figure the oil got into the pay sand? Did the sawdust stay out of your well into the bottom water sand?

A. Yes sir, and followed that channel. I have wells much closer than the Salt Lake that were never affected at all. In fact, I have one well that's in front of one of the Salt Lake wells and it is not affected, yet one of their wells was affected. It shows that there must be an underground channel connecting those wells together.

Mr. Stoner: In mudding up wells like that, the mud would follow the line of least resistance.

Mr. Prehoda: The reason I don't think there is much mud in my own sand is this: I think after you mud a certain length of time, the mud accumulates below the shoe and would keep it out of the oil sand. I think it coats over just the same as in a rotary hole.

Q. This rotary mud that you used; was that light?

A. No, it is heavy.

A PROCESS FOR REDUCING THE VISCOSITY OF HEAVY OIL.

By E. A. Starke.[1]

The oils of the Casmalia section of the Santa Maria field are of an exceptionally viscous and sticky nature. Their gravity ranges from some 8° to 16° B. With an average gravity of some 10° B. combined with high viscosity, it is impossible to commercially transport them by such means as pipe lines without subjecting them first to a preliminary treatment to raise their gravity and lower the viscosity.

It is only during the past few years that the importance of the heavy oils has been realized and their intensive exploitation carried on. Formerly these heavy oils had a limited use as road building materials, and in the manufacture of asphalt. As soon, however, as the refiners of light petroleum products placed the residuum from their refining operations on the market for the same purposes the demand for heavy petroleum fell off. In view of this, the heavy oil fields, such as those existing in Santa Barbara County, were neglected. Renewed interest, however, was taken in these fields when the demand for fuel oil rose to the figures we are witnessing today.

In order to be commercially useful, as a fuel, these heavy oils must be capable of transport through pipe lines without the application of heat, and, furthermore, their use must not be restricted to apparatus having specialized heating arrangements.

For the extensive fuel utilization of the Casmalia crude, a certain preliminary treatment is necessary in order to bring it up to the required standard. This treatment has heretofore consisted of heating the oil to a temperature of 180° F. and mixing therewith light distillate in a special type of mixer. In this way a high quality product is obtained which can be transported through a pipe line, and which meets the full market demands.

A number of objections arise against the above mode of treating the heavy crude, chief of which are the high cost and scarcity of light distillate, and secondly the fact that production of the mixed product is dependent on the supply of light distillates obtainable. A third important objection rests on the ground that full value is not obtained from the crude oil in this manner. For these reasons other methods of treating the crude were found imperative, with the result that the Doheny-Pacific Company adopted, at its Casmalia property, a process patented by the writer in 1905, and which had already been proved commercially successful.

The Starke process is based on the principle that when a heavy asphaltic oil or residuum is heated to 700° F. the crude oil suffers dissociation or cracking, particularly that part of the crude which renders it sticky and viscous. In order that the process can be carried out successfully it is necessary that the oil be dry, as water interferes with the cracking operation. Not only does this method reduce viscosity, but a certain percentage of synthetic gasoline is formed. If it is desired to obtain a large percentage of this cracked gasoline, it is necessary to employ pressure. However, even when the prime object is to reduce viscosity, from 3–6 per cent of synthetic gasoline is formed during the operation. It is advisable in all events to so employ the process that the largest amount of synthetic gasoline under the given conditions is obtainable. In this way the operating costs are lowered.

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[1] We are enabled to publish this article through the courtesy of E. A. Starke, Chemical Engineer, Berkeley, California.

In a general way the process as it is practically carried out consists in pumping 100 barrels of dry oil into a 125 barrel still. Approximately 40 barrels of oil is now distilled off. The heat under the stills is then discontinued, and the distillate is reunited with the residuum contained in the still. This may be done either by first cooling the still and adding the distillate, or by mixing the distillate and residuum without preliminary cooling. The last method is the one generally adopted. In this way the cold distillate is thoroughly mixed with the heavy asphalt still bottom, at the same time cooling the mixture sufficiently so that the charge can be withdrawn. The resulting product has now a gravity of between 11–12° B. and the viscosity is about equal to that of a 16° B. Kern River crude. The heat units per barrel are equal to those of the Kern River crude, about 18,800 B.t.u. but being of a lower gravity. A barrel of this processed oil will produce more steam than a barrel of the Kern crude or residuum. The viscosity of the oil produced will necessarily be dependent on the amount of distillate taken from the crude and then reunited. If, however, more than 50 per cent of the crude is removed during the distillation process, a certain amount of carbon is formed which would be classed as an impurity. Actually this carbon is so finely divided that it does not interfere with the uses of the oil.

During the distillation from three to five per cent of the oil is given off as a gas which contains much of the sulphur present in the well. This gas is burned under the stills as fuel. Considered in detail, the plant as operated on the Doheny property presents the following features:

A continuous distillation system utilizing a battery of four stills working as a unit. These stills are of 600 barrel capacity and are provided with the necessary preheaters, condensers and other distilling accessories. Comparatively dry oil is pumped through a heat exchanger into still number one. Here the temperature of the oil is raised to that point at which the most volatile fractions are given off. The oil then passes from the bottom of this still into the center and back section of still number two, maintained at a higher temperature than still number one. Here a second fraction is is given off, and passed into the condenser. From still number two the oil flows into the center of still number three, maintained at a higher temperature than the preceding two. Here a third portion of the volatile constituents contained in the oil are given off. From the third still the oil flows into a fourth one. Here the oil attains a temperature of about 750° F. and the remaining fractions distill off.

The residuum of still number four is now passed through the inner tubes of the heat exchanger before mentioned, where it loses a part of its heat to the incoming crude. From the heat exchanger the residuum flows into a sort of churn where it is mixed with the distillate portions recovered from the various stills. The resulting mixture is now limpid and can be pumped and used in the same manner as the 16° B. Kern River oil, and is equal in quality to the best crude used for fuel purposes.

In conclusion it may be stated that with the increasing use of synthetic gasoline as a source of motive power, the heavy petroleum oils assume an important role from an economic standpoint, and such methods as the one described, by which both high grade crude fuel oil and synthetic gasoline are obtained, merit the attention of the oil producer.

CHAPTER II.

COMPARISON OF VARIOUS METHODS OF EXCLUDING WATER FROM OIL WELLS IN CALIFORNIA.

(As shown by results of *test for water shut-off*)

By R. E. Collom, Chief Deputy.

All of the mechanical operations at a drilling well which aim at the protection of productive oil or gas bearing formations from infiltrating waters, and also certain geologic features, contribute data for determining the result of the test for water shut-off. These data include:

(1) Total depth of hole and depth to which hole is bridged to land water string.
(2) The method of drilling: Rotary or Cable.
(3) The diameter, weight and length of casing used as water string.
(4) The method of making water shut-off.
(5) Such natural features as stratigraphic position, chemical composition and hydraulic head, or fluid-level, of water or waters excluded.
(6) Record of all other formations entered, both above and below the depth of shut-off, including oil, gas and water.

In this paper the various items specified above are discussed only as they apply to operations for shutting of *top* or *intermediate* waters in the oil fields of California.

Definition of Terms.

Water shut-off: The term water shut-off is commonly applied, in California, to the condition whereby waters, native to strata penetrated in drilling, are excluded from the well and prevented from moving below a given depth, by landing or cementing a string of casing at that depth.

Top water: The term top water is applied to waters overlying the shallowest productive oil zone in any given area.

Intermediate water: The term intermediate water is applied to waters native to strata lying between any productive oil zones.

Water string: A water string is a string of casing which is used to exclude water from an oil well.

Source of Data.

The official[1] reports on test of water shut-off of the Department of

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[1] There are two kinds of reports issued to operators: (1) Reports on Test of water shut-off; and (2) Reports on Proposed Operations. The reports all bear serial numbers showing the kind of report, the district from which the report originates, and the individual number of each report. Thus, Report No. T 1–24 is Report No. 24, on test of water shut-off, originating in District No. 1. Likewise, Report No. P 3–56 is Report No. 56, on proposed operations, originating in District No. 3. Each of these reports bears a decision or recommendation, either relative to a test or to certain proposed work. The decisions of the respective districts are summarized for the Annual Report, and appear under the subject "Decisions," in the chapters covering work done in each district during the fiscal year.

Petroleum and Gas, issued from the various field offices during the fiscal year closing June 30, 1918, are the principal source of the data in items 1 to 5, inclusive, referred to above. They are taken from 890 reports on test for water shut-off. They are tabulated by districts, fields, and sectional or lease locations in Tables I, II, III, IV and V. These tables are printed on pages 148 to 195. The respective results of test and supporting remarks are also given in the tabulations. Complete data were not available in all instances.

With few exceptions, only those reports on shut-offs made in the process of new work or deepening operations are considered in this discussion. This excludes numerous tests of the efficacy of plugs for shutting off water below productive formations—so-called ''Bottom water''—or plugs in abandonment jobs, or tests of strings set with packer in redrilling jobs. These are more properly remedial operations and, therefore, are aside from the purpose of this discussion.

Tests.

The usual pumping or bailing test for water shut-off is made to determine one specific question, namely, whether or not water is prevented from passing around the shoe of the water-string and into the well. It is well worth noting that when a pumping or production test is made, a positive answer can be given *only* if the production shows no water. If water is present, it is evident that the source of the water can not be determined by the mere act of pumping the well. In such cases it therefore becomes necessary to bridge or plug under the water string, or perform other operations, in order to determine the source of the water. Pumping or production tests, although apparently expedient for quickly getting the well on the producing list, should be avoided where it is possible to do so. It becomes increasingly difficult and distasteful to perform the necessary testing and corrective operations as the well is deepened through formations below the shoe of the water string. The time to determine whether or not a string of casing shuts off water is when the minimum number of complications can enter into the results. Such possible complications will be discussed later under Factors in Results of Tests.

The following are the necessary steps in a bailing test[1]:

(1) *Bail the well to bottom or to a predetermined fluid level.* The correct depth to bail a hole depends upon (a) the fluid level of water back of the casing, (b) the strength of casing to resist collapse, (c) the nature of formations and condition of the hole at or shortly below the shoe of the casing.

(2) *The well should stand undisturbed for at least twelve hours.* Neither bailer, tools nor casing should be run in the hole during this time.

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[1] Method of testing Water Shut-off at Oil Wells. Second Annual Report, Bull. 82, Cal. State Mining Bur. pp. 57–58.

(3) *At the time for test, run the bailer to determine amount of increase of fluid and depth of hole.* It is assumed that careful measurements were made to determine exact depth of shoe and that the casing was tested for leaks before the time for test of shut-off. Bailer or tools should show sample of formation.

Depth of Hole.

Under the caption "Depth of Hole" in Tables I to V inclusive, is shown the total depth drilled and, where a bridge was reported, the depth to top of bridge. When no bridge was reported the depth shown is that which the hole measured at the time of test. Rules for measuring depths of wells and casing, as applied to work passed upon by the State Oil and Gas Supervisor, were published in the Second Annual Report[1]. The depth of well, in all tests, is determined by running a bailer or string of tools to the bottom of the well. It is necessary to check carefully the distance the derrick measures-over on the sand-line or drilling-line. This distance is the basis of all measurements at tests. In rotary holes there is often a considerable discrepancy between the depth of hole measured by drill pipe before cementing and the depth measured at the time of test. The first depth, especially in contract holes, is usually "long." Where there is a considerable discrepancy in these measurements the question arises as to whether or not the hole is actually open below the shoe of the water string. For example, report No. T 4–1012[2] states that the casing was first reported cemented at 2205 feet, and later reported cemented at 2188 feet, based on measurement of drill pipe after drilling out the cement. With this discrepancy of 17 feet, it would be difficult even to imagine the exact depth of hole and position of shoe.

For the ideal testing conditions, the hole should be open to formation in place, and no deeper. Ordinarily, five feet ahead of the shoe is sufficient.

When the hole has been bridged, aside from the condition discussed above, an entirely different set of factors enters the problem. These will be discussed later under Factors in Results of Test.

The Method of Drilling.

Discussion of methods of drilling is here confined to the efficiency of operations with rotary or cable tools in landing casing to shut off water. Cost and time sheets of the adherents of either method should, as far as economy of operations, up to the time of shutting off water, is concerned, present substantial reasons for the preference for which ever method is used. However, the question of economy in drilling an oil well is not finally determined until water is excluded and the well is completed. If, in cementing the water string, or attempting a formation shut-off, the job is not successful, the operator is confronted with the alternatives of redrilling, or of recementing, or of landing another string of casing or a liner. The expense of such operations is a considerable addition to the originally estimated cost. In order to operate at a minimum cost, it is well to consider, therefore, in what manner, if any, the method of drilling influences the operation of shutting off water.

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[1] Second Annual Report, Bull. 82, Cal. State Min. Bur. pp. 59–60.
[2] See Decisions, Midway Field, Sec. 9, T. 32 S., R. 24 E., M. D. B. & M.

In Tables I to V, under the caption "Water String," the method of drilling, whether by rotary or cable tools, is given for most of the wells. Also, in these tables, under the heading "Result," the successes and failures in each instance are given. Table VI gives a recapitulation of these items, with respect to successes and failures, for both methods of drilling. It also gives the percentage of failures for each method and the average percentage for both. The first six fields listed are those in which there was sufficient use for both methods to warrant comparison. There are ten fields, including Ventura County, in Group 7, in which the majority of the work was done with cable tools. This group shows that the proportion of failures, in landing water string with cable tools, is 15.5 per cent. The proportion of failures with cable tools, for all fields in the state, as shown in Group 8, is 14.4 per cent; and failures with rotary tools, for all fields, 21.8 per cent. In other words, for every three failures with rotary tools, there are only two with cable tools.

A study of Table VI shows, however, that this apparent disadvantage in the rotary method is due principally to results of operations in the Coalinga and Sunset fields. The failures, with rotary and with cable, for these two fields, are in the ratio of four to one. The Coalinga field shows 3.6 per cent failures with cable tools, which is by far the lowest for the state. The failures with rotary tools are 16 per cent for the Coalinga field. This is 6 per cent lower than the average for the state, and 3 per cent higher than the Midway field. The latter has the lowest percentage of rotary failures of all fields. The Sunset field shows 11.8 per cent failures with cable tools, which is two per cent lower than the average for all fields, and ranks next below Coalinga and Midway. The failures with rotary tools are 50 per cent for the Sunset field. This is by far the highest for either kind of tools in any field in the state.

It should be noted, before passing to the probable causes of failures in Coalinga and Sunset fields, that the respective percentages of failures for the rotary and cable tool methods, in the Midway, Coyote Hills, Montebello, and Lost-Hills-Belridge-McKittrick fields, do not vary a great deal from the percentages of combined failures for the respective fields.

TABLE VI. Comparison of Success and Failure of Water Shut-off as Between Casings Landed With Rotary and With Cable Tools.

Field and tools	Number of jobs			Percentage of failure
	Success	Failure	Total	
1. Midway—				
Rotary	87	13	100	13.0
Cable	76	8	84	9.5
Totals	163	21	184	11.0
2. Coyote Hills—				
Rotary	11	4	15	25.7
Cable	11	*5	16	31.2
Totals	22	9	31	29.1
3. Montebello—				
Rotary	18	†10	28	35.7
Cable	11	†6	17	35.3
Totals	29	16	45	35.5
4. Sunset—				
Rotary	19	‡19	38	50.0
Cable	30	4	34	11.8
Totals	49	23	72	31.9
5. Coalinga—				
Rotary	73	§14	87	16.1
Cable	54	2	56	3.6
Totals	127	16	143	11.2
6. Lost Hills, Belridge and McKittrick—				
Rotary	32	#7	39	18.0
Cable	67	14	81	17.3
Totals	99	21	120	17.5
7. Whittier, Puente, Olinda, Brea Canyon, Newhall, Ventura County, Santa Maria, Casmalia, Cat Canyon, Arroyo Grande, Kern River—				
Cable	185	34	219	15.5
8. All fields—				
Rotary	240	67	307	21.8
Cable	434	73	507	14.4
Totals	674	140	814	17.2

*Five cable recementing jobs not included.
†Four cable and five rotary recementing jobs not included.
‡Five rotary recementing jobs not included.
§Two rotary recementing jobs not included.
#One rotary recementing job not included.

In the Montebello field the proportion of failures for both kinds of tools—rotary 35.7 per cent and cable 35.3 per cent—are double the average for both methods for all fields—17.2 per cent. This is probably due to the uncertainties and hazards of drilling in undeveloped territory. Until a number of wells have been drilled, formations carefully logged, and experience has indicated the stratigraphic position of suitable formations in which to land casing for water shut-off, the hazard is greater than that which should obtain under settled conditions for drilling. In the developed fields, the operator's engineer can forecast with considerable accuracy, by the use of well logs, cross-sections, peg-models, subsurface contours, and other data, the depth at which a desirable stratum should be entered by the drill. The accuracy of the data is due to the additional fact that nearly all of the early development was done with cable tools.

The advantages that accrue from the use of such data is instantly reflected in a study of the percentages for Coalinga field operations. Coalinga operators are virtually the pioneers in the use of engineering methods for the study and direction of operations for shutting off water. The disadvantages of the use of rotary tools are, therefore, emphasized by the results in this field.

Inspection of Tables I to V, inclusive, shows that of 67 rotary failures for all fields, only two of the jobs were formation shut-offs. The Perkins cementing method explained on page 133 was used in 81 per cent of 65 cementing jobs.

Rotary Drilling in Coalinga and Sunset Fields.

Use of the rotary drill is confined principally to the East Side field in Coalinga. Stratigraphic conditions are quite consistent there. The Red Rock and top of Brown Shale[1] are good formational markers, and engineers' estimates, based on these markers for depth of oil bearing formations give close results. For example, the following statement is taken from comments on report No. P 5–318[2], in the list of Decisions, Coalinga field:

> "The well was surveyed by this department, and from the correct data an estimate was made which agreed within 4′ with the result as found by drilling."

Rotary failures are undoubtedly due to (1) discrepancies in measurements of rotary holes, already mentioned under "Depth of Hole," page 112; (2) the inability to log accurately the nature of formations entered; and (3) impossibility of bailing the hole to identify oil or water-bearing strata while drilling. It is not only possible, but it is quite necessary, to make close estimates for depths to land water string in the Coalinga East Side field. This point is illustrated by reference to recommendations on "Reports of proposed operations for the Coalinga field[3]. Report P 5–81 recommends shutting off water at 2370 feet instead of 2355 feet as proposed. Report No. P 5–100 recommends that water be shut off at 1980 feet instead of 1955 feet. Report

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[1] See First Annual Report, Bull. 73, Cal. State Min. Bur. East Side field—principal formations, pp. 62–65.

[2] Decisions, Coalinga Field, Sec. 2, T. 19 S., R. 15 E., M. D. B. & M. Standard Oil Co., Well No. 10, Report No. P 5–318. Chapter VII, *post*.

[3] See list of Decisions, Sec. 14, T. 19 S., R. 15 E., M. D. B. & M., Coalinga field.

No. P 5–306 recommends cementing at 2495 feet, instead of 2515 feet, as proposed. It will be noted that these differences are 15, 25 and 20 feet, respectively.

The above differences in estimates indicate that it is necessary to make water shut-off in a stratum of no great thickness. It is also necessary for the rotary driller to recognize and accurately log the marker formation and water and top-oil, in order that the engineer's estimate may be checked and revised, if necessary. In a number of cases in the Coalinga field and elsewhere, the rotary has not fulfilled this necessity. The items listed under Sec. 29, T. 19 S., R. 15 E., M. D. B. & M., Table V, give a case in point, with the exception that the red rock is not known to be present in this area. The various operations at this well are covered in list of Decisions for Coalinga field[1]. These operations exemplify the difficulties and additional expense mentioned in the opening paragraph of this section. Briefly, the operations were these:

The company proposed to cement casing at 2675 feet, estimating top of oil at 2695 feet. The department recommended cementing at 2650 feet. After considerable discussion relative to location of top oil sand (based on rotary log), the company cemented 10-inch casing at 2696 feet. Report No. T 5–68 shows that, after bailing for test, 760 feet of water entered the hole in 21 hours. It was later conclusively proved, by ripping the 10-inch casing at 2655 feet, that an oil sand existed at that depth. The record shows that not only had the rotary passed through an oil sand, but that the shoe of the casing was landed in a zone composed of the unrecognized oil sand and sandy shale—material entirely unsuitable for shutting off water. It may be noted, in passing, that the rotary log of this well catalogs a noninformative succession of strata, logged as clay and boulders, hard sand, shale and shell, for 2669 feet. Rotary "boulders" are usually the evidence of a condition, but not of a formation.

Careful operators in the Coalinga field are already questioning the practicability of present rotary programs. The writer is informed that at least one of the larger Coalinga operators is preparing to make a radical change in the present method of drilling. Such a change will involve landing a string of casing with rotary near the red-rock marker and carrying a smaller diameter casing with cable tools for water shut-off at the top of first productive oil.

The following evidence, taken from the transcript of a hearing[2] before the State Oil and Gas Supervisor, gives the opinions of rotary drillers and operators relative to the difficulties mentioned above. The evidence, centered about the drilling of certain wells with rotary in the Sunset field, is entirely applicable to the present discussion:

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[1] Decisions, Coalinga field, Sec. 29, T. 19 S., R. 15 E., M. D. B. & M., Shell Co. Well No. 7.

[2] Hearing relative to the drilling of Union Oil Company's "International" Well No. 7, Sec. 4, T. 11 N., R. 23 W., S. B. B. & M., Maricopa Flat, Sunset Field, held at Taft, California, April 9, 1918.

MR. COLLOM (to Witness E. A. Whitten, driller, Union Oil Co.): I would like to ask Mr. Whitten if he believes in drilling through this top sand, where it is of a thickness of twenty feet or so, whether the returns from that well, from that sand, would show at the surface of the well, even if the sand were present.

A. Oh, yes.

MR. COLLOM: You believe it would be possible to detect the presence of that sand?

A. You can not tell in your returns from your rotary, but you can tell the way the mud is pumping.

MR. COLLOM: Can you tell which ones are water sands and which ones oil sands?

A. We have encountered oil sands in spots, and by little bubbles of gas you can locate pretty closely by rotary drilling.

MR. COLLOM: What we are trying to get at in a condition of this kind is whether it would be possible to pass through it without detecting it with a rotary. We will say the drill plunged through that sand, but there would be no means of telling when the returns came to the surface that you have been passing through a water sand or an oil sand.

MR. SCHNEIDER (Commissioner): It would show some discoloration or something to show that it had some signs of life.

MR. COLLOM: As a matter of fact, it is a pretty risky matter to depend upon a rotary?

MR. SCHNEIDER: Yes, it is.

MR. MCLAUGHLIN: Let me ask the rest of the Commissioners if they are not convinced of that.

A COMMISSIONER: I think you can.

MR. MCLAUGHLIN: Mr Saine?

MR. SAINE (Commissioner): I believe you can.

MR. MCLAUGHLIN: Mr. Ballagh?

MR. BALLAGH (Commissioner): I think you can.

MR. MCLAUGHLIN: Mr. Schneider, you are the only one who agrees with me that it is risky. Oh, Mr. Williams, I forgot to ask your opinion. Mr. Williams, isn't it risky? Can you always pick out a sand and know that it exists when you are drilling with a rotary?

MR. WILLIAMS (Commissioner): It would be rather risky. If it were a good lively sand it might show up, but if it were dead it might take twenty feet without showing. It all depends on the character of the sand.

MR. MCLAUGNLIN: As I understand, what they have been trying to bring out is that there is some difficulty in locating a sand with a rotary.

MR. SAINE: I might be able to help you. In drilling with a rotary there are only certain formations that you can plunge through. Now, if he was drilling in a clay or shale and then struck an oil sand it would begin to plunge, and he would undoubtedly stop until he got the returns from that formation from the bottom of the hole and washed it out to see whether he had any sand. He could tell, a man that is accustomed to it, could tell almost the minute his formation changed whether he was drilling in clay or shale, or a sand, or a shell.

* * * * * * *

Clay Trammell, being first duly sworn, testified as follows:

Mr. Johnson: What company are you with?

Mr. Trammell: Lake View No. 2 and Interstate Oil Company.

Mr. Johnson: And you are working as a driller for this company, are you?

A. Yes, sir.

Mr. Johnson: In drilling wells in the Maricopa Field, have you ever, in drilling with a rotary, known of a case where your drill ran through the top oil sand and you failed to find a sand, detect it, in drilling?

A. Yes, sir.

Mr. Johnson: What well was that, Mr. Trammell?

A. Well No. 20, Interstate. We drilled by the sand, or I did myself, and at that time I recorded it as being a soft formation, and then afterwards we circulated, well, I don't know, but we drilled on through this and afterwards went on with the rotary. But we gave it plenty of time.

Mr. Johnson: Do you know whether on Lake View No. 2 there was a similar condition?

A. Well, I can't recall whether we actually drilled through the sand on Lake View No. 2.

Mr. Johnson: Is it your opinion that it is possible to pass a sand in a thickness such as in the one we have been discussing with the rotary without discovering its character?

A. You certainly can if you are not very careful.

Mr. McLaughlin: By being very careful you mean every man on every tour would have to watch it all the time?

A. Yes, sir.

Mr. Collom: In drilling through this particular sand on Interstate No. 20, how long did you circulate until you noticed, until you were able to detect sand in the returns?

A. When a well is 2500 feet two hours or two hours and a half gives plenty of time. Before you do that, before you start in circulation, the principal thing is to clean your ditch so this will show up, wash your ditch out good, and then your returns will show exactly from where you are drilling.

Mr. Collom: Great care would have to be exercised in order to be able to catch it, and in the case you mention it would probably take three or four hours before you got returns at the surface.

A. It would take that long to find a change of the formation. Of course, if there was a change of formation you would know it.

Mr. Collom: Of course, in the particular well that you are speaking about, No. 20, as soon as you got within the zone of the soft sand you would know it.

A. We have the measurements of the well correctly and I know that I had got into something soft, and I drilled on down until I had a change of formation: I didn't know just what it was; but I was looking for this sand at the time, but I had to go ahead until I got the change of formation.

MR. COLLOM: In this particular case, Mr. Trammell, if you had continued drilling ahead, when you struck this soft sand, is it or is it not probable that you would have been able to detect the returns after two or three hours' drilling?

A. I hardly think so. It would be difficult if you don't look.

Most of the failures for the rotary drill in the Sunset field are listed in Table IV under Sections 4 and 5, T. 11 N., R. 23 W., S. B. B. and M. The formational conditions here are much more complex than in Coalinga. However, the persistence and regularity of the many water and oil bearing formations permit correlation of strata, in cross-sections, with considerable assurance. The major causes of failure attributed to drilling in the Coalinga field also apply here.

It is true that the proper preparation of the hole, prior to making water shut-off, has a great deal to do with the success of a job. There has been considerable speculation as to whether or not rotary mud, near the shoe, prevents a successful shut-off. If the mud fluid near the shoe is completely displaced with cement, all other conditions being favorable, the job would be a success. However, the results of cementing operations, which will be discussed later, undoubtedly throw the burden of proof upon this phase of rotary drilling, rather than upon the method of cementing.

In order to make successful shut-off, especially where the strata of suitable formations are thin, the rotary works at a disadvantage. It is required to locate definitely, by the speed of drilling and the length of time it takes returns to get to the surface, various changes of formations and the depths of such changes. The testimony of drillers has shown that this is difficult to do. The time required for formation samples to be conveyed to the surface in the circulating mud increases directly with the depth of hole and thickness of mud, and inversely with the speed of circulation. Therefore, the greater the depth the greater the chance of error in making a correct log. It is required to make suitable landing of water string, in formations thus logged, depending upon the measurement of hole as shown by drill pipe. It is evident that there are many more approximations than known quantities in the foregoing, and an error of ten feet, or even five, considering the thickness of the formations sought, is enough to make the difference between success and failure.

In view of the fact that 50 per cent of the rotary jobs in the Sunset field were failures, it is evident that rotary methods, with respect to the requirements mentioned, are in need of considerable study and improvement.

The following is the average thickness of strata in the Sunset field, where the most failures occurred, in which suitable formation for shut-off must be found:

Below "Lowest Top Water" and above Oil Zone A—30 feet;
Below Oil Zone A and above "Upper Flowing Water"—25 feet;
Below "Upper Flowing Water" and above Kinsey Sand—50 feet;
Below "Lower Flowing Water" and Wilhelm Sand—40 feet.

Details of the difficulties and failures incident to the drilling of certain wells in this area are given in Formal Order No. 5, Union Oil Co. well No. 7 (International), and the accompanying tables and graphics, pages 413 to 450. Complete details of oil and water zones encountered from the surface downward are given by Deputy Superviser R. N. Ferguson in the Second Annual report.[1]

Diameter, Weight and Length of Casings.

One of the principal advantages of drilling claimed for rotary tools is that long water strings can be landed with a minimum use of conductor casings. The sizes of casing to be used depend upon formational conditions and the depths to be drilled. In some areas the choice of either rotary or cable method of drilling will cause no difference in the casing program to the depth of landing water string.

In order to give a more concise idea of the amount of drilling done by each method, as to depth of hole and diameter of water strings, the itemized data for these features, as shown in Tables I to V, inclusive, have been summarized in the form shown in Tables VII, VIII, IX, X and XI. In these tables segregations are made under principal headings of "Rotary" and "Cable." In the column headed "Length," the depths of all water strings have been classified in four groups, namely, those measuring 100 to 1000 feet, 1001 to 2000 feet, 2001 to 3000 feet, and 3001 feet and over. To the right of this column are other columns showing the diameters of nine different sizes of casing. The strings of 3-inch and 2-inch casing shown under Section 8, T. 3 S., R 9 W., S. B. B. & M., Table I, are not included. The number of water strings landed by either tool, in any field, for each depth group are shown in these columns. The small letter appearing at the right of each number signifies the method of shut-off, whether cement (c) or formation (f). The data of this further classification will be discussed later under method of shut-off.

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[1] Second Annual Report, Bull. 82, Cal. State Min. Bur.—Sunset field—pp. 234 to 239.

TABLE VII. Showing Depths and Diameters of Casing Landed for Water String by Rotary or Cable Tools; Also Method of Shut-off, Formation (f), or Cement (c).

DISTRICT No. 1 (Los Angeles and Orange Counties).

Fields	Method of drilling	Length of casing, feet	Diameters of casing									Totals	
			15½ in.	12½ in.	11⅝ in.	11 in.	10 in.	9⅝ in.	8¼ in.	6¼ in.	4½ in.	Rotary	Cable
Coyote Hills	Rotary	100-1,000											
		1,001-2,000											
		2,001-3,000					7c						
		3,001+					4c		1c	2c		14	
	Cable	100-1,000											
		1,001-2,000											
		2,001-3,000											
		3,001+							15c	7c			22
Montebello	Rotary	100-1,000											
		1,001-2,000		16c			2c						
		2,001-3,000		9c			7c						
		3,001+										34	
	Cable	100-1,000											
		1,001-2,000		1c			1f, 5c		2c				
		2,001-3,000					7c		4c				
		3,001+											20
Whittier, Puente, Olinda, Brea Canyon, Newhall	Rotary	100-1,000	1c										
		1,001-2,000											
		2,001-3,000											
		3,001+										1	
	Cable	100-1,000	1c	1f, 3c			1c		2f, 1c	3f	1f		
		1,001-2,000	1f	1f, 10c			2f, 4c	1c	1c				
		2,001-3,000					5c		6c	2c			
		3,001+							1c				46

TABLE VIII. Showing Depths and Diameters of Casing Landed for Water String by Rotary or Cable Tools; Also Method of Shut-off, Formation (f), or Cement (c).

DISTRICT No. 2 (Ventura County).

Fields	Method of drilling	Length of casing, feet	Diameters of casing									Totals	
			15½ in.	12½ in.	11⅝ in.	11 in.	10 in.	9⅝ in.	8¼ in.	6¼ in.	4½ in.	Rotary	Cable
Ventura, Ojai, Santa Paula, South Mountain, Sespe, Bardsdale, Simi, Piru.	Rotary	100-1,000	1c										
		1,001-2,000											
		2,001-3,000											
		3,001+										1	
	Cable	100-1,000	1c	3f, 9c			7f, 4c	3f	2f, 1c				
		1,001-2,000		3c			3c		1c				
		2,001-3,000					2c		1c				
		3,001+							1c				41

TABLE IX. Showing Depths and Diameters of Casing Landed for Water String by Rotary or Cable Tools; Also Method of Shut-off, Formation (f), or Cement (c).

DISTRICT No. 3 (Santa Barbara, San Luis Obispo and Santa Clara Counties).

Fields	Method of drilling	Length of casing, feet	Diameters of casing									Totals	
			15½ in.	12½ in.	11⅝ in.	11 in.	10 in.	9⅝ in.	8¼ in.	6¼ in.	4½ in.	Rotary	Cable
Arroyo Grande, Casmalia, Cat Canyon, Santa Maria.	Rotary	100-1,000	1c										
		1,001-2,000		1c			4c						
		2,001-3,000					6c		2c				
		3,001+				1c						15	
	Cable	100-1,000	2c	7f, 15c			6c		2c				
		1,001-2,000		22c			19c		2c				
		2,001-3,000					1c		3c	2c			
		3,001+							8c	7c	1c		97

TABLE X. Showing Depths and Diameters of Casing Landed for Water String by Rotary or Cable Tools; Also Method of Shut-off, Formation (f), or Cement (c).

DISTRICT No. 4 (Kern County).

Fields	Method of drilling	Length of casing, feet	Diameters of casing									Totals	
			15½ in.	12½ in.	11⅝ in.	11 in.	10 in.	9⅝ in.	8¼ in.	6¼ in.	4½ in.	Rotary	Cable
Lost Hills, Belridge, McKittrick	Rotary	100-1,000	--------	37c	--------	--------	2c	--------	--------	--------	--------	40	
		1,001-2,000	--------	--------	--------	--------	--------	--------	--------	--------	--------		
		2,001-3,000	--------	--------	--------	--------	--------	--------	--------	--------	--------		
		3,001+	--------	--------	--------	--------	--------	--------	1c	--------	--------		
	Cable	100-1,000	--------	1f, 4c	3c	--------	7f, 32c	--------	2f, 7c	--------	--------		81
		1,001-2,000	--------	1c	--------	--------	2c	--------	7c	--------	--------		
		2,001-3,000	--------	--------	--------	--------	1c	--------	3c	1c	--------		
		3,001+	--------	--------	--------	--------	1c	--------	1c	6c	2c	--------	
Midway	Rotary	100-1,000	--------	--------	1c	--------	--------	--------	--------	--------	--------	102	
		1,001-2,000	--------	--------	--------	--------	1f, 11c	--------	4c	--------	--------		
		2,001-3,000	--------	1c	--------	17f, 2c	3f, 25c	--------	1f, 16c	--------	--------		
		3,001+	--------	--------	--------	--------	14c	--------	6c	--------	--------		
	Cable	100-1,000	--------	3f, 19c	1c	--------	1f, 2c	--------	2c	--------	--------		84
		1,001-2,000	--------	5f, 9c	--------	--------	3f, 15c	--------	2c	1c	--------		
		2,001-3,000	--------	--------	--------	--------	1f	--------	9c	2c	1c		
		3,001+	--------	--------	--------	--------	--------	--------	3c	5c	--------	--------	
Sunset	Rotary	100-1,000	--------	3c	--------	--------	2c	--------	--------	--------	--------	44	
		1,001-2,000	--------	12c	--------	1c	4c	--------	2c	--------	--------		
		2,001-3,000	--------	--------	--------	3c	1f, 9c	--------	5c	--------	--------		
		3,001+	--------	--------	--------	--------	--------	--------	2c	--------	--------		
	Cable	100-1,000	--------	--------	1f	--------	1f, 1c	--------	1f	--------	--------		53
		1,001-2,000	--------	1f, 6c	--------	--------	4c	--------	1f	--------	--------		
		2,001-3,000	--------	--------	--------	--------	--------	--------	1f, 8c	5c	1c		
		3,001+	--------	--------	--------	--------	--------	--------	1c	1c	--------	--------	
Kern River[1]	Cable	*100-1,000	--------	3f	10f, 3c	--------	5c	2f, 1c	1f	--------	--------		*30
		1,001-2,000	--------	--------	--------	--------	--------	--------	1c	--------	--------		
		2,001-3,000	--------	--------	--------	--------	--------	--------	2c	--------	--------		
		3,001+	--------	--------	--------	--------	--------	--------	2c	--------	--------	--------	

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*Also 3 strings 7⅝-inch formation shut-off between 100 and 1000 feet.

[1] One rotary job, 10-inch, cemented between 2001–3000 feet.

TABLE XI. Showing Depths and Diameters of Casing Landed for Water String by Rotary or Cable Tools; Also Method of Shut-off, Formation (f), or Cement (c).

DISTRICT No. 5 (Fresno County).

Fields	Method of drilling	Length of casing, feet	Diameters of casing									Totals	
			15½ in.	12½ in.	11⅝ in.	11 in.	10 in.	9⅝ in.	8¼ in.	6¼ in.	4½ in.	Rotary	Cable
Coalinga	Rotary	100-1,000	--------	--------	--------	--------	--------	--------	--------	--------	--------		
		1,001-2,000	--------	2c	--------	1c	33c	--------	1c	--------	--------		
		2,001-3,000	--------	--------	--------	8c	40c	--------	2c	--------	--------		
		3,001+	--------	--------	--------	--------	1c	--------	--------	--------	--------	88	
	Cable	100-1,000	--------	1c	--------	--------	4c	--------	3f	--------	--------		
		1,001-2,000	--------	--------	--------	--------	8c	--------	9c	1c	--------		
		2,001-3,000	--------	--------	--------	--------	--------	--------	12c	2c	--------		
		3,001+	--------	--------	--------	--------	--------	--------	12c	5c	--------	--------	57

TABLE XII. Tools, Length and Diameter of Casing, Method of Shut-off.

All districts. All fields.

Diameter	15½-in.		12½-in.		11⅝-in.		11-in.		10-in.		9⅝-in.		8¼-in.		6¼-in.		4½-in.		Totals
Tool	Rotary	Cable	Rotary	Cable	Rotary	Cable	Rotary	Cable	Rotary	Cable	Rotary	Cable	Rotary	Cable	Rotary	Cable	Rotary	Cable	
Depths—																			
100-1,000				18f		11f				16f		5f		11f		3f		1f	65f
	3c	4c	40c	53c	1c	7c			4c	55c		1c		13c					181c
1,001-2,000		1f		7f					1f	3f				1f					16f
			31c	51c			2c		54c	50c		1c	7c	25c		2c			223c
2,001-3,000							17f		4f	1f			1f	1f					24f
			10c				13c		95c	16c			23c	48c		12c		2c	219c
3,000+																			
							1c		19c	1c			10c	44c	2c	33c		3c	113c
Rotary totals							17f		5f				1f						23f
	3c		81c		1c		16c		172c				40c		2c				315c
Cable totals		1f		25f		11f				23f		5f		13f		3f		1f	82f
		4c		104c		7c				122c		2c		130c		47c		5c	421c
Total rotary and cable		1f		25f		11f		17f		28f		5f		14f		3f		1f	105f
		7c		185c		8c		16c		294c		2c		170c		49c		5c	736c

Relative to the use of long water strings, Table VII shows that in the Coyote Hills field there were seven strings of 10-inch casing cemented, after landing with rotary, between depths of 2001 and 3000 feet, and four strings were cemented at depths greater than 3000 feet. There were no 10-inch water strings landed with cable tools. However, there were 15 strings of 8¼-inch casing landed with cable tools and cemented at depths greater than 3000 feet. Table X shows that in the Midway field 17 strings of 11-inch were landed with rotary for formation shut-off, and two strings were cemented, between depths of 2001 and 3000 feet. No 11-inch water strings were landed with cable tools. It shows that three shallow shut-offs were made with cable tools between depths of 100 to 1000 feet. No 10-inch casing was landed with rotary between these shallow depths. On the other hand, the rotary landed three strings of 10-inch for formation shut-off and 25 strings for cement shut-off, between depths of 2001 and 3000 feet. A single string of 10-inch was landed for formation shut-off with cable tools between these depths. There were 14 strings of 10-inch casing landed with rotary and cemented at depths greater than 3000 feet. There were no 10-inch water strings landed with cable tools at depths greater than 3000 feet.

Table XII gives a recapitulation of data in Tables VII to XI, inclusive, and further illustrates the condition referred to above. The data have been rearranged so as to make direct comparisons, for each diameter of casing, to determine which tool landed the greater number of strings in each of the four depth-groups chosen. The blocks of dark figures indicate the predominating method of drilling for the respective depths and diameters of casing.

A study of Table XII reveals the following interesting features:

(1) The 10-inch casing is the predominating favorite for water strings landed with rotary tools. In fact there were more 10-inch water strings (177) landed with rotary than any other single size casing with either rotary or cable tools.

(2) With respect to diameters, which control the maximum size of bit to be used in further drilling, the diameter of 10-inch is the exact mean of the largest and smallest diameters in common use, namely, 15½-inch and 4½-inch.

(3) The number of 12½-inch, 10-inch and 8¼-inch water strings landed with cable tools is almost evenly distributed among the three sizes, respectively, 129, 145 and 143.

The rotary method is specialized to long water strings of a limited range of diameters. The range for cable tools is much more elastic. In recent years the rotary method has been used to a large extent by operators or contractors, who engage to land two or three thousand feet of a certain diameter of casing for water shut-off. Economically—both as to cost and time of drilling—there can be no criticism of such procedure, providing the primary principles of protection and conservation are not disregarded. The preceding evidence and data show that, in order to meet these requirements, there is a real necessity for change and improvement in present methods of attempting to land water strings with rotary in narrow and more or less speculative margins of safety.

Method of Shutting Off Water.

The principal methods of shutting off water in oil wells in California were described in the Second Annual Report.[1] Only the methods shown under the heading "Shut-off" in Tables I to V, pp. 148–195, will be discussed in this paper. The main classifications are formation shut-offs and cement shut-offs.

Formation shut-off is the term applied to the operation of excluding water, where casing, with a plain shoe, is landed or driven into a stratum of shale or clay using no artificial bond.

Cement shut-off is the term applied to the operation of excluding water, where hydraulic cement is used to form a bond between the casing and the formation in which the shoe of the casing is landed or driven.

Formation Shut-off.

Of 841 shut-offs for which data of the method are available 105 or 12.5 per cent were formation shut-offs. Of these shut-offs 62 per cent were made at depths between 100 and 1000 feet, 16 per cent were made at depths between 1001 and 2000 feet, 22 per cent—which, however, includes 17 shut-offs with 11-inch casing and 4 shut-offs with 10-inch casing; see Table X, Midway, Sunset fields—were made between depths of 2001 and 3000 feet. There were no formation shut-offs made at depths greater than 3000 feet. Only 11 per cent of the formation shut-offs were failures.

In the case of the above-mentioned shut-offs with 11″ and 10″ casing between depths of 2001 and 3000 feet, which were made by a single company, a study of Table XII shows that there were only three other formation shut-offs made between these depths. The case is mentioned because, aside from the operations of this company, formation shut-offs between these depths are uncommon. Only one other water string in the 841 jobs listed was landed for formation shut-off with rotary. There has been some question as to the efficacy of this practice. The results of test show that only 2 of the 21 jobs were failures. This is a little over 9 per cent. It is 3 per cent less than the failures for 65 formation shut-offs between depths of 100 and 1000 feet.

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[1] Methods of Shutting Off Water. Bull. 82, Cal. State Min. Bur. pp. 38-43.

It must be noted, however, that this operation would be practicable only in an area, such as this one, where formational conditions are exceptionally favorable and thick beds of shale give the necessary leeway for successful landing of water string with rotary.

For example, the following is a portion of the log of a well in this area[1] which aptly illustrates the advantageous conditions for formation shut-off:

11-inch, 47-pound casing landed at 2255 feet.

Water logged at 550 to 560 feet.

Depth to		Thickness	Name of formation
Top of formation	Bottom of formation		
1,925	2,025	100	Clay and shale.
2,025	2,075	50	Clay.
2,075	2,150	75	Blue shale, little gas.
2,150	2,200	50	Clay.
2,200	2,230	30	Blue shale.
2 230	2,240	10.	Clay.
2,240	2,250	10	Shale.
2,250	2,255	5	Blue clay—11 in., landed 2,255 ft.
2,255	2,364	109	Blue shale.
2 364	2,376	12	Sandy shale—gas.

The foregoing shows a range of over 400 feet of formation, almost any part of which would be suitable for formation shut-off. It may be added that the same character of formations are shown in this log from a depth of 1450 feet to the depth at which the above record begins. For the immediate purpose of excluding water at the shoe, the formation shut-offs, referred to above, give satisfactory results at test.

The percentages of formation shut-offs, made between various depths, have already been given. In Table XIII the percentages of failures of formation shut-off for the several depth groups, previously used in this paper, are shown. Possibly more accurate representation could be based on a segregation by frictional depths, that is, length of water string in contact with formation, either to the surface, where no other casing has been used, or to the shoe of the next larger conductor casing.

This table shows the total successes and failures for both formation and cement shut-off. It shows the gross percentage of failures for each method of shut-off and the average percentage for both methods. It also shows the number of successes and failures for each method of shut-off under segregation of (1) water strings landed with cable tools and (2) water strings landed with rotary tools.

Formation shut-offs are restricted to the shallower wells. Deadweight of casing and formational friction prevent successful driving in deep holes. Comparison of data in Table XIII shows a smaller percentage of failures for formation than for cement shut-offs. In making formation shut-off the time of idleness and expense incident to a cementing job are greatly reduced or even eliminated. On the other hand, it is probable that cement jackets or thick mud around water strings will insure greater life to the casing through protection from corrosion.

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[1] See Table IV, Sec. 35, T. 31 S., R. 23 E., Sec. 9, T. 32 S., R. 24 E., M. D. B. & M.

The subject of corrosion of water strings in formation shut-offs deserves serious consideration. The operator should determine the corrosive properties of the water to be excluded before a final drilling program is adopted. For example, Deputy Supervisor Kirwan,[1] when at Coalinga, reported an extremely corrosive condition as follows:

> "Four wells surrounding Traders Oil Co. well No. 41 show an average production of 35% emulsion and water. Mr. McQuigg's[2] letter dated Jan. 31, 1917, states that water eats out the casing in from three to five years duration and requires replacing."

Mr. Kirwan suggested that this condition could be overcome by cementing water string with the Perkins or any system that will force cement back of the pipe, for a cement jacket, to top of the well.

In the First Annual Report[3] the writer noted a number of instances of failure from corrosion. In five wells in the Pinal Dome-Hobbs area, Santa Maria field, top water ate through two strings of casing, 12½-inch and 10-inch, in each well, in an average time of six years. These were formation shut-offs.

Cement Shut-off.

Cement is used in shutting off water for the primary purpose of making an impervious bond between the foot of the water string and formation in place. There are a number of secondary purposes, for which varying amounts of cement, in excess of the quantity sufficient for excluding water at the shoe, are placed back of the casing. The principal secondary purposes are the following:

(1) Cement jacket around casing to prevent corrosion.
(2) Cement jacket around casing to reinforce same against collapse.
(3) Cement seal, filling space between outside of casing and wall of hole, to prevent movement of all fluids or gases from their native strata into other susceptible strata exposed by the drill.
(4) Cement seal, filling space between outside of casing and wall of hole, to prevent the expulsion of mud fluid from porous formations into which it has been placed under pressure for the purpose of rendering said formations impervious to movement of water, oil or gas.

The cement jacket to prevent corrosion has already been mentioned under formation shut-off. The practice of pumping large quantities of cement back of a string of casing for the purpose of reinforcement is quite general, although one or both of the purposes, mentioned under 3 and 4 above, are usually part of the operator's object. The variety of purposes and results dependent upon these secondary, and often interlocking, mudding[1] and sealing operations presents problems of a nature and magnitude not within the scope of the present discussion. Comments on reports of proposed operations[2] No. P 3–40, P 5–39, and P 3–26 show a few instances in which sealing operations were recommended. The results of these operations are still a matter for future determination. It is the writer's opinion that sealing, with cement alone, should only be attempted in shale bodies, or other formations of a similarly rigid nature. It is almost impossible to place a cement plug in sand, or other unstable formation, in open hole. Such conditions for a cement seal would be even less favorable.[3]

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[1] Kirwan, M. J.—Letter in Departmental files relative to method of shut-off on Traders Oil Company Well No. 41, Sec. 24–20–14, Coalinga field. February 2, 1917.

[2] McQuigg, M. V., President, Traders Oil Co.

[3] First Annual Report—Bull. 73, Cal. State Min. Bur. p. 202.

Amount of Cement.

In the operations studied there is a wide range in the quantity of cement used. In the Midway field 650 sacks of cement were used in Well No. 21 of the St. Helens Petroleum Company, Ltd. (Table IV, Sec. 16, T. 32 S., R. 24 E.). The length of this water string was 2296 feet. The amount of cement used should have been sufficient to reach to the surface.[4]

Report No. T 4–1266 shows that the General Petroleum Company, operating in Sec. 2, T. 29 S., R. 21 E., Belridge field, made a water shut-off for prospecting purposes, in well No. 141, with 5 sacks of cement. Table IV shows that a number of similar shut-offs were made by this company. This method of shut-off is part of a systematic program of prospecting and testing formations. There are a number of tar and water sands overlying the productive oil zone in this area. These strata are apparently lenticular and some of the tar lenses carry water. Under these conditions it has been found impracticable to use cross-sectional correlations for anything further than a rough estimate for the depth to shut-off water. In the event that water formations are entered below the shoe, after a prospect shut-off is made, the water string is pulled up and carried below the sand for another shut-off. B. E. Parsons, geologist of the company, states that in nearly fifty of these operations there have been only two cases in which they were unable to remove the shoe-joint intact. In some cases no greater quantity of cement is used for a permanent shut-off. Water is excluded, however, by a sort of combination cement and formation shut-off. For example, reports No. T 4–1328 and No. T 4–1169 show that for two such jobs 6 sacks and 12 sacks of cement, respectively, were placed with dump bailer. The cement fluid was mixed as thick as it could be handled. The shoe was then driven into a few feet of small hole. When tar sands were excluded by the water string in the above operations they were mudded under pressure before cementing. Formation shut-off, using mud fluid also, is being used for prospecting purposes, in the Casmalia field, as shown by reports No. P 3–193, P 3–192 and T 3–127.[1] A shut-off for prospecting purposes (Report T 4–623) was made by the California Midway Oil Company in well No. 8, Sec. 32, T. 31 S., R. 23 E., Midway field. The 6¼-inch casing was cemented at 3185 feet in blue clay with 5 sacks of cement, using dump bailer. Later the company pulled the casing loose and carried it to a depth of 3425 feet.

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[1] See report on "Use of Mud-laden Fluid, pp. 77 to 106.

[2] See List of Decisions, Santa Maria Feld, Sec. 26, T. 9 N., R. 24 W., and Los Almos Rancho.

[3] Well No. 6–D, Belridge Oil Co., Sec. 33, T. 28 S., R. 21 E., covered by Report No. T 4–768 gives an instance of probably successful cement seal. Water flowed between 6¼ in. and 8¼ in. casings before cementing. After cementing both casings remained full of water, but with no movement.

[4] The Standard Oil Co. is quoted in Report No. P 4–1161 to the effect that the 6⅝ in. and 8¼ in. casings were cemented together in Spreckles Well No. 2, Sec. 16, T. 30 S., R. 22 E., McKittrick field. The 8¼ in. casing was landed at 2200 ft., the 6⅝ in. casing was cemented 3032 ft.; 832 ft. open hole, with 80 sacks cement, Perkins process. The C. C. M. O. Co. in working on Well No. 26, Sec. 8, T. 32 S., R. 23 E., Midway field, found the 10 in. and 12½ in. casings cemented together. The cement came to a depth of 11 ft. below surface. (Top of 12½ in. casing.) Top joint of 10 in. could not be unscrewed on account of cement. The 12½ in. casing was 741 ft. long. The 10 in. casing was cemented at 1075 ft. with 160 sacks fast setting cement, by Huber & Wilson.

Depth of Cementing.

It has already been noted that formation shut-offs are limited to comparatively shallow wells. There is no such limit for cement shut-offs although failures appear to increase with depth. Of 756 cement shut-offs shown in Table XIII, there were 25 per cent made between depths of 100 to 1000 feet, 30 per cent between depths of 1001 to 2000 feet, 29 per cent between depths of 2001 to 3000 feet, and 16 per cent at depths greater than 3000 feet. The proportion of failures for cementing at these depths is 14.9, 17.5, 18.3 and 20.4 per cent, respectively. However, there is a notable difference in cementing after cable and rotary landings at these different depths. In each instance the percentage of rotary failures is greater. The average excess of rotary failures for all depths is 7 per cent. The details of these percentages are shown in the two columns in Table XIII, in dark-face figures, under the headings Cable and Rotary.

Method of Cementing.

There are five principal methods of cementing noted in a study of the reports. These are dump bailer, Huber & Wilson, Perkins, Scott, and tubing. There are a number of variations in application of each of these methods depending upon mechanical and formational conditions at the well. Some operators use their own crews and do their own cementing either by dump bailer, tubing, or a variation—and the forerunner—of the Perkins method, without plugs. Most operators, however, prefer to engage a specialist in cementing oil wells because he appears at the well with the necessary equipment for mixing the cement and placing it in the well. The operator furnishes the water and cement and usually the crew, with the exception of one or two operatives of the cementing company who man the pumps and other equipment and place the cement.

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[1] See List of Decisions, Casmalia field. Doheny-Pacific Petroleum Co. Lease No. 1. Lease No. 2. Also Report on Casmalia field operations, p. 361.

TABLE XIII. Shows Percentage of Failures for Both Methods of Shut-off for Various Depth Groups and Also Segregates Failures as Between Rotary and Cable Tools on the Same Basis.

Shut-off, depth and method	Success	Failure	Total	Percentage failures	Cable landing			Rotary landing		
					Success	Failure	Percentage failure	Success	Failure	Percentage failure
100-1,000—										
Formation	57	8	65	12.3	57	8	**12.3**	------	------	------
Cement	154	27	181	14.9	114	19	**14.3**	40	8	**16.7**
Totals	211	35	246	14.2	171	27	**13.6**	40	8	**16.7**
1,001-2,000—										
Formation	15	1	16	6.2	14	1	**6.7**	1	------	------
Cement	184	39	223	17.5	107	22	**17.0**	77	17	**18.1**
Totals	199	40	239	17.4	121	23	**16.0**	78	17	**17.9**
2,001-3,000—										
Formation	22	2	24	8.3	2	------	------	20	2	**9.1**
Cement	179	40	219	18.3	70	8	**10.2**	109	32	**22.7**
Totals	201	42	243	17.3	72	8	**10.0**	129	34	**20.8**
3,001+—	------	------	------	------	------	------	------	------	------	------
Formation	------	------	------	------	------	------	------	------	------	------
Cement	90	23	113	20.4	67	15	**18.3**	23	8	**25.8**
Totals	90	23	113	20.4	67	15	**18.3**	23	8	**25.8**

No detailed description of the various methods will be given in this discussion. F. B. Tough[1] has covered the subject in considerable detail. His report, in addition to the descriptive matter and discussion of advantages and disadvantages of various methods, contains numerous illustrations and diagrams.

There are at least three kinds of dump bailer in common use for cementing. The kind to be used is indicated by depth and diameter of hole and amount of cement to be placed. The amount of cement that can be placed for cementing a water string varies from 5 to 70 sacks. The use of dump bailer is more applicable to shallow shut-offs.

The distinctive feature of the Huber & Wilson method is the addition of a chemical solution, formula a secret, to the cement fluid which induces quick setting. The cement is pumped either through the casing or tubing, depending upon circumstances.

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[1] Tough, F. B.—Method of Shutting-off Water in Oil or Gas Wells. Bull. 163, U. S. Bureau of Mines.

The Perkins Process comprises a patented feature of wooden plugs which are placed in the casing, one going ahead and the other following the cement fluid as it is pumped. The first plug lodges in the bottom of the casing, which is lifted off bottom while pumping cement. When sufficient water, which follows the second plug, is pumped into the casing to displace the cement fluid the two plugs come together at bottom. There is a disk of rubber belting attached to the second plug and fitting the casing snugly. This disk acts as a valve and stops further circulation after the plugs come together. Two plugs are not always used. Report No. P 3–56, listed under Decisions, Casmalia field, Doheny Pacific Petroleum Company, well No. 1, Lease 2, gives the details of the various steps in a shut-off job by the Perkins Cementing Company.

The distinctive feature of the Scott method is a specialization, covered by patent, of the tubing method of cementing. The patent covers a casing head packer, with relief port, for use with tubing in pumping cement back of the casing. If necessary the cement fluid, in tubing and casing, can be displaced with water through this port. In the Scott process the cement is mixed in a hopper alongside the pump. Cementing is done by Scott, however, without the use of tubing. In fact, tubing is used only in cable-tool holes with short friction where there is no danger of freezing casing. In rotary jobs the cement is pumped through the casing and is displaced from the casing by following it with mud-fluid.

In the tubing method the cement is pumped to the bottom of the hole, and behind the casing, with a string of tubing. Sometimes a casing packer is placed near the bottom of the tubing for the purpose of directing all cement fluid back of the casing. In other jobs the tubing is set in a casing head packer. In the latter case the hole is completely filled with water to prevent return of cement fluid into casing. There is danger in the tubing method of not being able to pull tubing before cement starts to set.

The dump-bailer method was used in 106 shut-off operations and 86 of these were performed at depths between 100 to 2000 feet. Table XIV has been prepared to show the relative number of shut-offs attempted by each method of cementing. These data are also segregated by methods of drilling. The last column shows the percentage of work, out of 702 operations, for each method. The percentages shown, under total, at the foot of the table confirm previous statements as to the excess of rotary failures, namely, 7 per cent, over those of Cable tool drilling.

TABLE XIV. Method of Cementing and Tools Used.

Name of method	Cable				Rotary				Total wells cemented				Percentage work each method of cementing
	Total	Success	Failure	Percentage failure	Total	Success	Failure	Percentage failure	Total	Success	Failure	Percentage failure	
Dump bailer	94	82	12	13	12	10	2	17	106	92	14	13	15
Huber & Wilson	33	27	6	20	12	8	4	33	45	35	10	22	6
Perkins	206	167	39	19	234	183	51	22	440	350	90	20	63
Scott	18	16	2	11	18	16	2	11	36	32	4	11	5
Tubing	51	42	9	18	24	21	3	13	75	63	12	16	11
Totals	402	334	68	14	300	238	62	21	702	572	130	18	100

The depths of hole, formational conditions, pressures and methods of drilling should control to a great extent the method of cementing to be used. The depths, already mentioned, for which dump bailer is used, and the percentage of failures shown in Table XIV indicate that the limitations of this method have been fairly well determined. The failures for the Perkins method are higher than the average for all methods. The Perkins method was used in 63 per cent of all operations, and 78 per cent of the rotary operations, listed in Table XIV.

Although one of the largest companies in the state contracts all of its cementing operations by this method, and a number of other companies use the method almost exclusively, it is probable that in a number of instances some other method, such as dump bailer or tubing, would have given better results.

No matter how efficient or expedient a method of cementing may appear, it is the history of oil well operations that each new well presents a new combination of formational and mechanical conditions. It is hardly possible, therefore, to conceive of a method, almost automatic in so far as the attention of the operator is concerned, which can be applied efficiently in all cases. Results show that operators should make a more careful determination of the method of cementing necessary.

The tubing method appears to be quite efficient for shut-offs on rotary jobs. In the 24 rotary shut-offs listed, 23 were made at depths greater than 2000 feet. Results for the Huber & Wilson and Scott methods, although listed, possibly do not warrant conclusions because of the relatively small number of operations performed.

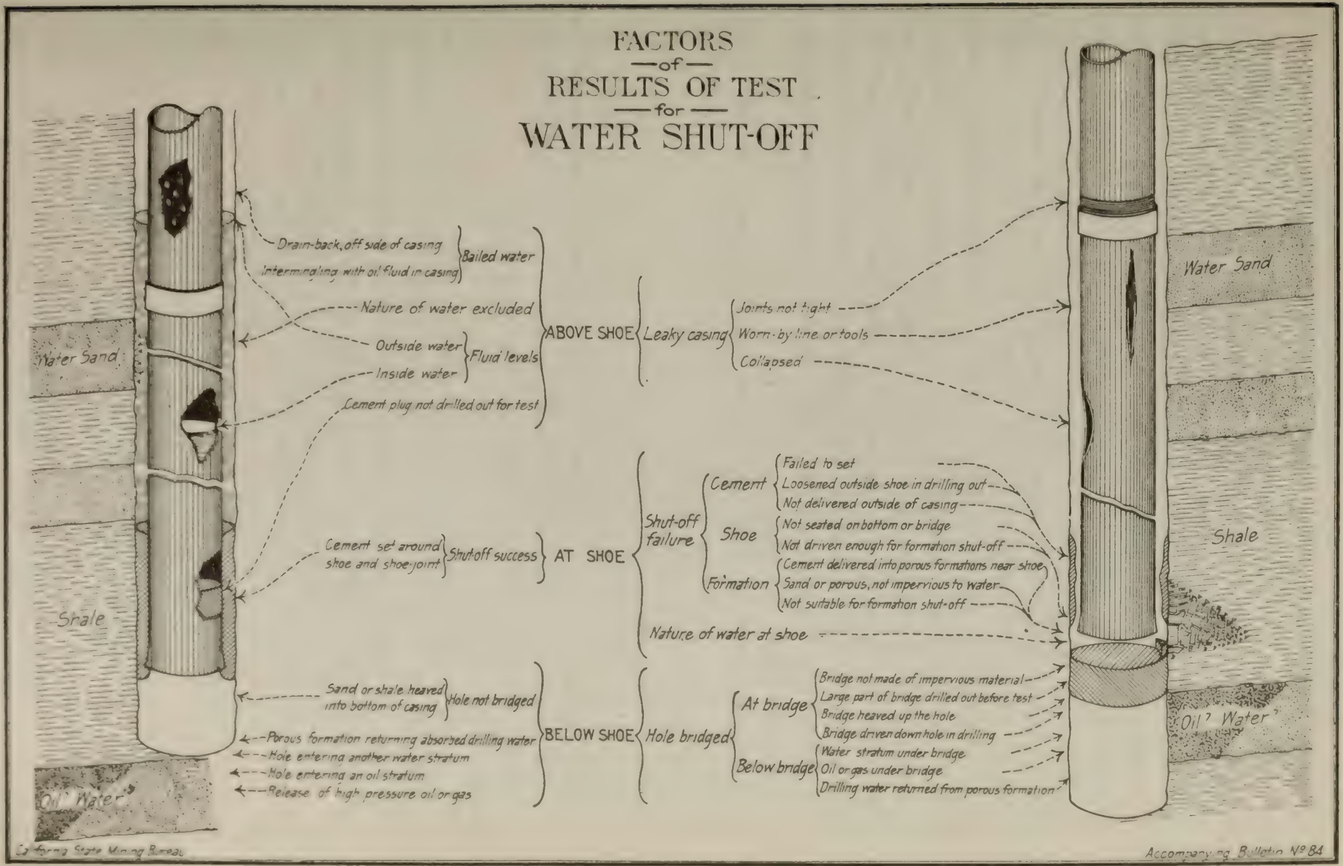
FACTORS
—of—
RESULTS OF TEST
—for—
WATER SHUT-OFF
Drain-back, off side of casing
Intermingling with oil fluid in casing
Bailed water
Nature of water excluded
Outside water
Inside water
Fluid levels
Cement plug not drilled out for test
ABOVE SHOE
Leaky casing
Joints not tight
Worn by line or tools
Collapsed
Cement set around shoe and shoe-joint
Shutoff success
AT SHOE
Shut-off failure
Cement
Failed to set
Loosened outside shoe in drilling out
Not delivered outside of casing
Shoe
Not seated on bottom or bridge
Not driven enough for formation shut-off
Formation
Cement delivered into porous formations near shoe
Sand or porous, not impervious to water
Not suitable for formation shut-off
Nature of water at shoe
Sand or shale heaved into bottom of casing
Hole not bridged
BELOW SHOE
Hole bridged
At bridge
Bridge not made of impervious material
Large part of bridge drilled out before test
Bridge heaved up the hole
Bridge driven down hole in drilling
Below bridge
Water stratum under bridge
Oil or gas under bridge
Drilling water returned from porous formation
Porous formation returning absorbed drilling water
Hole entering another water stratum
Hole entering an oil stratum
Release of high pressure oil or gas
Water Sand
Shale
Oil? Water?
California State Mining Bureau
Accompanying Bulletin Nº 84

FIG. 7.

FACTORS OF RESULTS OF TEST FOR WATER SHUT-OFF.

The results of test for water shut-off, as between success or failure in excluding water, have been used in this discussion as the basis of conclusions regarding the relative efficiency of the principal methods of drilling wells and shutting off water. Details of results of test are listed in tables I to V inclusive under the headings *Success* and *Failure*. A study of these details will show that it is often necessary to identify a number of factors, such as drilling water, fluid levels, heaving formations, plug in casing, etc., before a definite statement can be made as to whether or not water is excluded at the shoe of the water string.

The most positive result of test is one in which, if the hole is bailed dry, it remains dry for the period of test; or, if it is bailed to a certain fluid level, there is no change in the fluid level during the period of test; or, if water appears, the water is known to be coming into the hole around the shoe of the water string. The details of results already mentioned will show that such ideal tests are in the minority. Usually other extraneous factors appear in the result of the test or inspection incidental thereto.

The factors have been divided by the writer into three groups, as follows:

(1) Above the shoe.
(2) At the shoe.
(3) Below the shoe.

The diagram, Figure 7, on page 135, illustrates the arrangement of the various factors under each group. These will be discussed briefly, beginning with the group of factors above shoe.

Factors Above Shoe.

One of the factors above the shoe is that of water entering the well through leaky casing. Leaks in the water string are due to insufficient tightening of joints, collapse, or line wear—the last mentioned, rarely.

A good example of leak in water string, due to insufficient tightening, is covered in report of test at a well of the Associated Oil Company,[1] Casmalia field. At the time of the first test water was entering the well from an undetermined source. The company ran a casing tester and found casing leaking at the rate of 670 gallons per day. The casing—960 feet long—was screwed up 26 inches. After the casing was tightened, the tester, when run to former depth, showed one pint of water in one-half hour. The size of the casing was 12½-inch, 40-pound.

In well No. 38 of the Shell Company, Coalinga field,[2] test of 10-inch, 40-pound, water string showed 156 feet of water in 26¼ hours. A casing leak was found at a depth of 230 feet. The casing—1925 feet long—was screwed up 10½ inches, and test then showed 25 feet water in 16 hours.

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[1] Decisions, Casmalia field. Associated Oil Co.—Punta de la Laguna Well No. 4—Morganti, shut-off, T 3-114.

[2] See Decisions, Coalinga field. Shut-off T 5-203, Sec. 14, T. 19 S., R. 15 E.

It is probable that this factor could have been more easily determined by bailing the casing to a safe depth before the cement was drilled out. A pressure test inside the casing will not prove as conclusively as bailing whether or not the casing is tight, because it is possible to sustain pump pressure against a number of small leaks.

Casing quite frequently collapses as the result of injudicious bailing. Any extensive tests to determine that a water string has collapsed are seldom necessary. In fact, when there is such a condition, unless it appears feasible to swage the casing, the well never comes to a test. Collapse of unsafe lengths of 12½-inch, 40-pound casing has been noted most frequently. It is also noted that the collapsing strength of 12½-inch, 40-pound casing is 500 pounds per square inch (*see* Table XV), the lowest collapsing strength of any size or weight of casing in common use.

For example: the Doheny-Pacific Petroleum Company[1] in the Casmalia field lost a string of 12½-inch, 40-pound casing through collapse. The casing was originally cemented at 1803 feet, and collapsed at 1440 feet upon bailing. In well No. 1, Quintero, of the Union Oil Company,[2] a water string of 12½-inch, 40-pound casing collapsed, after cementing and bailing, at about 1200 feet. The casing was swaged, but did not exclude water. In Darlington well No. 1 of the Petroleum Midway Company[3] a string of 12½-inch, 40-pound casing was cemented at a depth of 1821 feet. Upon bailing to a depth of 1380 feet for test of water shut-off, the casing collapsed at a depth of 1500 feet. Because of the excessive lengths, nothing other than collapse should have been expected in the three cases mentioned.

In order to overcome conditions such as the foregoing, where a long string of large size casing seems necessary, it is better practice[4] to use two weights of casing, putting the heavier weight casing on bottom. There appears to be no well defined rule as to the ratio of combination of the two different weights.

Table XV, giving the depths of water exerting pressure enough to collapse, for various diameters and weights of casing, is taken from the First Annual Report.[5] A factor of safety of at least 2, that is, dividing the figures in the last column of the table by 2, is recommended.

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[1] Decisions. Doheny-Pacific Petroleum Co. Shut-off. Report No. 3–25. Well No. 8, Soladino lease, Casmalia field.

[2] Decisions, Casmalia field. Union Oil Co.—Quintero, Well No. 1, Shut-off. T 3 42.

[3] Decisions, District No. 1, Montebello field. Sec. 31, T. 1 S., R. 11. P. 1 279.

[4] See Table V, Sections 14, 26 and 27, T. 19 S., R. 15 E.

[5] First Annual Report—R. P. McLaughlin. Bull. 73, Cal. State Min. Bur. p. 223.

TABLE XV.

Size of casing (nominal)	Weight per foot pounds (nominal)	Collapsing strength, pounds per square inch	Depth of water exerting pressure enough to collapse casing (feet)
4¼-inch	16	4,715	10,880
4½-inch	13	2,900	6,700
4½-inch	15	3,605	8,320
5⅝-inch	20	3,295	7,620
6¼-inch	20	2,345	5,420
6¼-inch	24	3,215	7,420
6¼-inch	26	3,650	8,420
6¼-inch	28	4,080	9,420
6⅝-inch	20	1,980	4,570
6⅝-inch	26	3,075	7,080
6⅝-inch	28	3,490	8,060
6⅝-inch	30	3,850	8,900
7⅝-inch	26	1,945	4,480
8¼-inch	28	1,660	3,840
8¼-inch	32	2,150	4,960
8¼-inch	36	2,635	6,080
8¼-inch	38	2,880	6,640
8¼-inch	43	3,510	8,100
9⅝-inch	33	1,285	2,970
10-inch	40	1,425	3,290
10-inch	45	1,795	4,140
10-inch	48	2,025	4,680
10-inch	54	2,510	5,800
11⅝-inch	40	835	1,930
12½-inch	40	500	1,150
12½-inch	45	750	1,730
12½-inch	50	1,010	2,330
12½-inch	54	1,215	2,800
13½-inch	50	650	1,500
15½-inch	70	795	1,840

Some operators follow a policy, rather strenuous at times, of bailing a water string to bottom, regardless of the lowest probable depth to which fluid will be reduced during the life of the well. If conditions, such as danger from collapse, or heaving sands, or gas strata of high pressure, prohibit bailing dry, the well should be bailed to a depth at which there is several hundred feet difference between fluid levels inside and outside the casing. It is advantageous, for this reason, if for no other, to carefully record the fluid levels of water strata encountered in drilling. It is difficult to make such observations in a rotary hole. In the last column of Table IV are shown a number of instances in which fluid was bailed to a depth less than total depth to shoe. In each of these instances it was necessary for the inspector to satisfy himself that the depth bailed was greater than fluid level of water excluded.

One of the commonest sources of small quantities of water in a well at the time of test is the minor feature called "drain-back." Drain-back is due to gravitation of water from bailed fluid sprayed onto the sides of the casing from leaky or gassing bailers, during preparation for test. It is difficult to compute the maximum amount of water allowable for drain-back. It depends upon such features as condition of bailer and fluid, diameter and depth of casing. The following instance[1] will suffice, as one of many, for an example. A well in the Lost Hills field was bailed dry for test. At the end of 17 hours 10 feet of water had collected in the bottom of the hole. This was attributed to drain-back.

Besides spraying onto the sides of the casing, bailed water commonly intermingles with oil, when present, and is held in suspension. It is sometimes necessary to thief the fluid, at increasing depths, to bottom and make centrifuge tests in order to determine whether or not there has been a change in the water content of fluid.

This is illustrated in the following comments on test at M/C Well No. 37 of the Standard Oil Company, in Coyote Hills field.[2] On account of mixture of oil and water results of bailing tests at successively lower depths did not show sufficient information to warrant a conclusion. Further tests at a later date were made. Oil and water were still considerably mixed. From the results it was not possible to conclude whether or not water contents of fluid had increased. Well was passed for pumping test and at end of 30 days the well produced only 0.4 per cent water.

Another example is given in Report No. T 1–208 for Well No. 42 on the same property. The observations, taken from Deputy Supervisor Kirwan's report are as follows:

> "All free water had been bailed out. During the test the oil in the well stood near the surface. Samples of fluid from various depths showed a small amount of water and emulsion by centrifuge test. Approval to continue drilling was given. Recommended production test after completion."

It is advantageous to know the *nature* of the water excluded as well as the fluid level. The advantages of chemical analyses of waters have already been mentioned in the discussion of the formation shut-off. There are other familiar advantages not within the scope of this discussion.[3] With reference to results at test, an elementary knowledge of the nature of the water excluded, such as whether it was fresh water, brackish, salt or sulfur, is often sufficient for the inspector to determine the source of a water which may be present.

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[1] Decisions—Lost Hills field. Sec. 29, T. 26 S., R. 21 E., M. D. B. & M. Associated Oil Co. Well No. 2-D. Shut-off. T 4–668.

[2] Decisions. Coyote Hills field. Sec. 18, T. 3 S., R. 10 W. Standard Oil Co. Well No. 37. Shut-off. Reports No. T 1–90, T 1–95 and T 1–190.

[3] Analyses of Water—Coalinga west side field. Bull. 73, Cal. State Min. Bur. pp. 85 and 86. Analyses of Water—Coalinga field. Bull. 69, Cal. State Min. Bur. p. 160. Analyses of Water—Casmalia field. Bull. 82, Cal. State Min. Bur. p. 206. Analyses of Water—Casmalia field; see Chapter V, p. 367, this report.

Factors at Shoe.

The factors at the shoe arise from failure to get a job. Such failures may be due either

(1) to the nature of formations in which landing was made;
(2) improper preparation of the hole for shut-off;
(3) ineffective placing of cement.

In making a cement shut-off the cement may fail to set because of gas agitation or a continuance of fluid circulation after cementing. In order to keep the gas quiet, the maximum hydrostatic head possible is held in the casing after cement is placed. This will also prevent differential movements of cement fluid to a large extent.

For the purpose of neutralizing the supposed unfavorable chemical reactions between certain native waters and cement fluid, compounds such as bicarbonate of soda or hydraulic lime are put into the well ahead of the cement in some instances. The necessity of this practice is questionable.

An example of this practice is shown in shut-off operations of the Oak Ridge Oil Company[4] in the South Mountain field, Ventura County. In cementing a string of 12½-inch, 40-pound casing at 630 feet, the 75 sacks of cement used was preceded by 100 pounds of bicarbonate of soda.

A few companies in the state use hydraulic lime in cementing operations. The lime is supposed to perform a dual purpose. It is sent ahead of the cement and back of the casing in order to seal crevices and cleanse the exposed formations so that the cement can make better contact. It is also supposed to alter waters unfavorable to setting of cement and thereby hasten crystallization. There can be no chemical reaction between the lime and cement. The saturated solution of calcium hydroxide provided by the presence of the lime will facilitate the formation of calcium silicate crystals so as to make for improvement in the strength of the concrete. This, of course, applies to mixtures of lime and cement fluids.

Shertzer[5] gives the following typical composition of two hydraulic limes and also a typical cement:

	Lime No. 1	Lime No. 2	Cement No. 1
Insoluble residue	.62	2.39	1.00
SiO_2	22.10	14.17	22.00
Al_2O_3	1.82	6.79	7.5
Fe_2O_3		2.34	3.5
CaO	66.72	63.43	6[illegible].0
MgO	1.17	1.54	1.0
SO_3	.49	1.63	1.5
CO_2	.64	3.64	.5
H_2O	5.36	2.69	.5
Alkali and loss	1.08	1.38	.5

[4] Decisions—District No. 2, South Mountain field. Oak Ridge Oil Co. Well No. 5, Sec. 17, T. 3 N., R. 20 W., S. B. B. & M., Report T 2–530.

[5] Letter to the department from Tyrrell B. Shertzer, District Engineer, Hydrated Lime, Bureau National Lime Manufacturers Association, Pittsburgh, Pa.

The specific gravity of hydraulic lime is about 2.90 and weight per cubic foot about 43 pounds. The best hydraulic limes contain from 13 to 17 per cent of silica, alumina and iron oxide combined. The cementing index varies from .33 to 1.06.

In cementing oil wells any beneficial effects claimed for the lime must of necessity be limited. The lime fluid when pumped into the holes must displace the water around the shoe of the casing. The lime fluid is rapidly followed, and displaced, by the cement fluid. As a result of these direct displacement actions, rather than an intermingling of fluids, it is highly probable that the fluid which finally sets around the shoe of the water string, the most critical position of the shut-off, is unadulterated cement.

In a number of jobs covered in the listed results of tests the cement used was preceded by hydraulic lime. For example, in seven wells of the Doheny–Pacific Petroleum Company, in the Casmalia field, an average of 117 sacks of hydraulic lime to 171 sacks of cement was used. Report No. P 3–56, listed under Decisions of District No. 3[1], gives the details of the various steps in a shut-off in which 60 sacks of hydraulic lime were pumped into the well preliminary to the usual cementing operations.

In this job $8\frac{1}{4}$-inch, 28-pound casing was cemented in a 10-inch hole at 2453 feet. One sack of cement should fill 7.8 feet of hole. From the fact that there were complete fluid returns at the surface, during the operation, it is probable that when the plugs came together the cement fluid, containing 150 sacks of cement, filled not only the 543 feet of annular space between the casing and the 10-inch hole, but extended above the shoe of the 10-inch conductor casing. Such being the condition, the 60 sacks of hydraulic lime were probably placed in the space between the 10-inch and $8\frac{1}{4}$-inch casings.

Most of the other items shown in the diagram under Factors at the Shoe, when the shut-off is a failure, are self-explanatory. However, the following notes from several reports will illustrate the more important features:

Shoe not set on bottom: In Well No. 6 of the Interstate Oil Company[2] there was a 180-foot rise in water at time of test. Shut-off was a failure. Measurements showed 5-foot plug in casing above shoe. Concluded shut-off failed because iron in bottom of hole prevented casing from seating at time of cementing.

Cement delivered into porous formation near shoe: In Well No. 14, Soladino[3], the 10-inch casing was cemented with 100 sacks of cement.

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[1] Decisions, District No. 3, Casmalia field. Doheny Pacific Petroleum Co. Well No. 1, Lease 2.

[2] Decisions, Sunset field, Sec. 4, T. 11 N., R. 23 W., Interstate Oil Co. Well No. 6. Shut-off; Report T 4–676. Also Table IV.

[3] Decisions, Casmalia field. Soladino Lease. Doheny Pacific Petroleum Co. Well No. 14. Drill: Report P 3–167.

Shut-off was tested and found satisfactory. Well was drilled into production and later showed water. Bridged under 10-inch casing and found water not shut off. Put a strain on 10-inch casing and pulled it loose. Shoe joint showed cement extended only four feet above the shoe. Concluded that cement fluid was pumped into fractured shale formation immediately adjacent to the shoe.

The courses open to the operator, when a shut-off fails, have already been mentioned under Methods of Drilling. They may be summarized as follows:

(1) He may cut off the water string, redrill and make another shut-off at a higher, lower, or equal depth.

(2) In the case of cement shut-off, he may attempt to re-cement, usually under pressure, or rip casing near shoe and force cement through rips.

(3) If a formation shut-off fails he may drive the casing further, or jar it loose and drill deeper and drive for another attempt or, after loosing, cement with dump-bailer or other method at the same depth.

(4) When the depth of failure is not close to oil-bearing formations he may prefer to drill ahead and cement another string of casing or a liner.

A study of the lists of decisions in the reports for the five districts will give numerous variations of methods employed where water shut-off was not successful. Operations at Baldwin Well No. 5[1] of Standard Oil Company in the Montebello field furnish a good example.

One method, re-cementing through tubing, is apparently not an efficient one. This statement is supported by data from the tabulation of the results of tests (see Table I, for Coyote Hills, Montebello and Whittier fields). Of seventeen jobs of re-cementing through tubing, under pressures varying from 500 to 1275 pounds per square inch, only one was successful. Table XI shows that these re-cementing jobs, and six other similar failures were not included in the data discussed under Methods of Drilling and Shutting-Off Water.

Ripping casing, to re-cement, was carried out to good effect by the Standard Oil Company[2] in Murphy-Coyote Well No. 36. The 6¼-inch casing was ripped and 50 sacks of cement was forced through rips. Subsequent tests showed that the company effected a complete shut-off.

The method of correcting formation shut-off failures has already been discussed under the subject of formation shut-off as applied to shut-off for prospecting purposes.

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[1] Decisions, Montebello field, Standard Oil So. Sec. 6, T. 2 S., R. 11 W. Report No. P 1–125. Baldwin No. 5.

[2] Decisions, Coyote Hill field. Sec. 17, T. 3 S., R. 10 W. Standard Oil Co. M/C Well No. 36. Shut-off. T 1–198.

The following illustrates the use of liners for correcting failures. The operations are those of the Southern Pacific Company[1] in the East Side field, Coalinga, Sec. 35, T. 19 S., R. 15 E. In Well No. 46, the cement job on 11-inch casing, at 2550 feet, failed. Cemented 8¼-inch liner at 2579 feet with dump bailer. Job failed. In Well No. 76, 10-inch shut-off, cemented at 2524, failed. Ran in 8¼-inch liner, 2495 to 2535 feet and cemented with 20 sacks cement, dump bailer. Shut-off satisfactory. In well No. 77 the shut-off with 11-inch casing at 2539 feet failed. Cemented 8¼-inch liner at 2552 feet. Shut-off satisfactory.

One other factor at the shoe, namely, nature of water, should be mentioned. For example, if fresh water is identified above the shoe and the water bailed, at test, is sulfur water, it is reasonable to conclude that the sulfur water is coming from some other source than around the shoe.

Factors Below Shoe.

The possibility of the presence of water, at test, other than that coming from back of the water string was mentioned under Factors at Shoe. In the fore part of this discussion, under the subject of depth of hole, it was stated as a rule, that the hole should be drilled only enough ahead of the shoe to enter formation in place. This distance usually should not be more than five feet. The following are a number of the possible complicating factors which may enter results of test when a hole is drilled into formations differing in character from that in which shut-off was made;

Sand or shale heaving into the bottom of the casing may interfere with test, by preventing movement of water around the shoe into the casing, when shut-off is a failure. If such a plug can not be permanently removed, by tools or by bailing, a string of casing with two or three joints of perforated or screen pipe is run into the hole to hold back heaving formations while making test, or the well is passed for a production test. The one-sided demonstrations gained by production tests have already been mentioned. Report No. T 4–753[2] gives an example of the use of screen pipe for test.

Drilling water is quite frequently absorbed in porous formations where the hole has been drilled for a considerable distance ahead of the shoe. When the well is bailed for test, this water is returned into the hole. The rate of return decreases upon continuous bailing and the water is often completely exhausted during test. Until such a decrease can be positively noted, however, the result of test is not conclusive. Bailing tests at Peshine Well No. 31[3] of the Associated Oil Company in the Casmalia field give a good example of the presence of drilling water. In Well No. 51[1] of the General Petroleum Company in Belridge field, 15 feet of drilling water and 305 feet of oil entered the hole in 30 hours.

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[1] Decisions, Coalinga field. Sec. 35, T. 19 S., R. 15 E., Southern Pacific Company. Well No. 46, Report No. P 5–243; Well No. 76, Report No. T 5–175; Well No. 77, Report No. T 5–194.

[2] Decisions, Belridge field. Sec. 2, T. 29 S., R. 21 E. General Petroleum Co. Well No. 151. Shut-off. Report T 4–753.

[3] Decisions, Casmalia field. Sec 19, T. 19 N., R. 34 W. Associated Oil Co. Peshine Well No. 31. Shut-off. Report T 3–10.

This latter is a case where the well had been drilled into the top of an oil stratum upon drilling out cement. The hydrostatic head of the drilling water forced some of the water into the oil sand and it was returned, upon bailing. In many cases where the hole breaks into an oil stratum, or where high pressure causes the oil confined below a thin crust to "drill itself in," a production test is the only recourse, other than bridging. A high pressure restricted flow of either oil or gas will, undoubtedly, hold water back. An instance[2] has been noted in which a flow of gas from a well, when unrestricted, allowed a flow of 700 barrels of water per day.

When the hole has been drilled ahead into a sand stratum and water appears in considerable quantity at time of test, it is difficult to determine whether the drill has entered a water stratum below the shoe or whether it is simply a case of failure of shut-off. In some instances the whole question of the success or failure in the development of a well, or even in the development of a producing sand over an entire property[3], hinges upon knowing definitely that the water alleged to be coming from a new sand below the shoe actually originated in that sand and not from around the shoe. The possibilities of a *new* water sand below the shutoff appear to furnish more uncertainties as to the condition and prospective future of a drilling well than any other single feature of operations. Providing that a sand is drilled into while preparing the well for test, it would be a difficult course of reasoning, based upon bailing tests only, which would enable one to differentiate indications and determine the source of water.

If the water is not shut off at the shoe, this new sand, which the operator presently may propose to exclude with another string of casing, may be none other than the oil sand he is looking for.

The complications here involved are illustrated by the following excerpt from transcript of a hearing[4] before the State Oil and Gas Supervisor relative to method of drilling wells in the Sunset Field.

> "MR. COLLOM: Mr. Kirwan, I would like to ask you with respect to this question that has come up relative to the possibility of testing a sand immediately below a shoe of casing in which there has not been a shut-off. Do you think that it would be possible in case you did not have a shut-off to definitely determine what is the nature of that sand immediately below that string of casing, that is, as to oil or water?

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[1] Table IV, Belridge field. Sec. 3, T. 29 S., R. 21 E. General Petroleum Co. Well No. 51 Marina. Shut-off. Report T 4–877.

[2] Second Annual Report—Method of Testing Water Shut-off at Oil Wells. Bull. 82, Cal. State Min. Bureau, p. 59.

[3] See graphic logs accompanying Order No. 5—International Well No. 7, Union Oil Company of Cal. Pp. 413 to 450.

[4] Transcript of hearing—Union Oil Company case—regarding wells in Maricopa Flat—Taft, Cal., April 9, 1918.

MR. KIRWAN: A. I believe there are some cases in which if the water above a sand is not shut off that it precludes the possibility of determining whether or not that sand carries oil, providing the water can not be bailed down to a reasonable level which would permit some sort of a test of that sand.

MR. COLLOM: What would be such a condition?

MR. KIRWAN: A. It would depend on the depth of the well, largely. I believe if you bailed the water ordinarily within two or three hundred feet of the bottom and it did not show up any oil, that there would be some probability that there was not an oil sand; however, not conclusive evidence.

MR. COLLOM: We will assume that you have not a shut-off and you bailed the hole and got water, do you think you would be justified in assuming that there was a water-sand?

MR. KIRWAN: A. No, I don't believe you would be justified in assuming it was a water-sand unless you plugged between the shoe and the sand, and then after drilling out the plug if you got water you would assume that it was a water-sand. I don't know any other way by which you could make that test except to plug inside of the water string up say about ten feet and then perforate above the plug, and if you didn't get water you could assume that the water was below the shoe of the water string. I am talking from an experience we have recently had in southern California, in which we demonstrated to the satisfaction of a company that the water which they claimed to be below the shut-off point was above the shut-off point by that method.

MR. COLLOM: What well was that, please?

MR. KIRWAN: A. We had Standard Oil—I believe Murphy Coyote Well No. 31. Another case in southern California was one in which after a shut-off was made above the oil sand, the oil filled up to within 120′ or such a matter from the surface. And, in my opinion, this very test goes to show that it is necessary in many cases to have the water shut off before you know the character of the sand below the shut-off point."

In addition to the foregoing, water sands erroneously logged, or oil sands not logged, will interfere with all future engineering study of conditions on a property. This does not mean that the operator should be any the less vigilant in his efforts to detect and correctly log water sands. An inspection of several thousand logs of oil wells drilled in California impresses one with the meagerness of this essential information.

Bridge Below Shoe.

As applied to this discussion a well is bridged below the shoe for one of two purposes:

(1) To form a solid seat, in contact with suitable formation, for cementing water string.

(2) As a plug in the well above oil, water, gas or other porous formations in order to determine if water is excluded at the shoe.

In either case the bridge must be made of impervious material, well bonded with formation, and of sufficient depth to withstand impact of heavy drilling, or heaving pressures from below. Bridges are made of rock, cement, bricks, lead-wool or other material. Bundles of wire line should not be used. They are hard to drill out or sidetrack. The bridge should be at least 20 feet in depth, if thickness of suitable formations will permit. A solid and well bonded bridge will exclude all those sources of complication mentioned in discussion of factors immediately below shoe.

An illustration of a combination of both of these requirements of a bridge, and some of the deficiencies, is given in comments on reports on proposed operations and tests at a well[1] of the Doheny-Pacific Petroleum Company in the Casmalia field.

The hole was bridged at 2450 feet to 2307 feet. Drilled out below $8\frac{1}{4}$-inch casing to test shut-off. Hole filled 2000 feet with water. Another bridge was placed just below shoe of $8\frac{1}{4}$-inch casing in order to test for shut-off. Test not conclusive. Drilled out and made another bridge. Test showed small amount of water. Concluded that if water was coming through or around bridge it would increase in flow upon drilling out. This conclusion was proved to be correct. Water entered at rate of 89 gallons per hour before drilling. Fluid level at 9:00 a.m.—1700 feet. Started drilling at 11:00 a.m. At 12:30 p.m. fluid level was 1235 feet, showing that 465 feet of water had entered the hole during the period of two hours in which the bridge was intact and one and a half hours after drilling started. This represented an average of 370 gallons per hour for the three and a half hours, but the water came in much faster after the drilling was done. The average increase after drilling out bridge was 281 gallons per hour.

Conclusion.

The foregoing discussion has developed the fact that, when water or oil, or both, move into the well during the period of test for water shut-off, the source of the fluid *must* be determined. The various source factors mentioned change from determinate to indeterminate, or the reverse, according to the extent and efficacy of drilling, bridging, plugging, or other operations conducted during the time the well is subject to test.

Table XVI has been prepared to serve as a guide for indicating the condition of hole necessary to determine, as between success and failure of shut-off, whether the source of fluid is above, at, or below, the shoe.

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[1] Decisions, Casmalia field. Lease 2, Doheny-Pacific Petroleum Company. Well No. 1. Reports No. P 3-70, No. P 3-91 and No. T 3-70.

TABLE XVI. Shows Condition of Hole Necessary to Determine Source of Fluid Entering a Well.

Position of factor	Source of water	Condition of shut-off	Mechanical condition of hole: Plug or bridge in shoe-joint	Mechanical condition of hole: Hole open just to formation in place	Mechanical condition of hole: Tight bridge just below shoe	Mechanical condition of hole: Leaky bridge, or no bridge
Above shoe	1. Leaky casing	Success	Determinate, by bailing	Determinate, by casing tester.	Determinate, by casing tester.	Excepting presence factors 4 and 5, determinate, by casing tester.
		Failure	Determinate, by bailing	Indeterminate, except occasionally by casing tester.	Indeterminate, except occasionally by casing tester.	Indeterminate.
At shoe	2. Drain-back	Success	Determinate, by bailing	Determinate, by bailing	Determinate, by bailing	Indeterminate.
		Failure	Determinate, by bailing	Indeterminate	Indeterminate	Indeterminate.
	3. Water around shoe (Factor 1, excepted.)	Success	Indeterminate*	No factor	No factor	No factor.
		Failure	Indeterminate*	Determinate	Determinate	Indeterminate.
Below shoe	4. Drilling water (Factors 1 & 5 excepted.)	Success	Indeterminate	Determinate	Determinate	Determinate.
		Failure	Indeterminate	Indeterminate	Indeterminate	Indeterminate.
	5. Native water	Success	Indeterminate	Excepting presence of factor 1, determinate.	Excepting presence of factor 1, determinate.	Excepting presence of factor 1, determinate.
		Failure	Indeterminate	Indeterminate, except by elimination factor 3.*	Indeterminate, except by elimination of factor 3*	Rarely determinate except when fluid level is higher than that of water excluded.
Above shoe	Oil and gas	Success	Determinate by perforating opposite oil stratum indicated by log or correlations.	Indeterminate	Indeterminate	Indeterminate.
		Failure	Determinate by perforating opposite oil stratum indicated by log or correlations.	Indeterminate	Indeterminate	Indeterminate.
Below shoe	Oil and gas	Success	Indeterminate	Determinate, by bailing	Determinate, by bailing	Factor 5 excepted, determinate. Frequently necessary to bail, swab, or pump.
		Failure	Indeterminate	Frequently indeterminate	Frequently indeterminate	Frequently indeterminate.

*Success or failure of shut-off is inferentially determinate by perforating or ripping shoe-joint above cement plug.

TABLE I. DISTRICT

Field, section, township, range, or lease	"T" report		Depth of hole		Water string			
						Casing		
	Number	Date	Total drilled (feet)	Bridged to (feet)	Tools	Diam. (inches)	Weight (pounds)	Length (feet)
Coyote Hills—								
Sec. 18, T. 3 S., R. 9 W., S. B.	1-24	9/15/17	2,915	------------	Rotary	10	40	2,900
	1-71	12/26/17	2,873	------------	Rotary	10	-----	2,850
Sec. 29, T. 3 S., R. 9 W., S. B.	1-223	5/29/18	2,460	------------	Rotary	10	-----	2,434
Sec. 8, T. 3 S., R. 10 W., S. B.	1-55	11/27/17	5,145	------------	Cable	3	-----	5,135
	1-172	4/18/18	5,475	------------	Cable	2	-----	5,472
Sec. 17, T. 3 S., R. 10 W., S. B.	1-39	10/25/17	3,950	------------	Cable	8¾	-----	3,940
	1-68	12/15/17	4,004	------------	Cable	6¼	-----	3,990
	1-149	3/21/18	3,629	------------	Cable	8¼	36	3,630
	1-17	8/30/17	3,530	------------	Cable	6¼	28	3,526
Sec. 18, T. 3 S., R. 10 W., S. B.	1-22	9/ 6/17	3,374	------------	Cable	6¼	28	3,368
	1-65	12/13/17	3,626	------------	Cable	8¼	36	3,618
	1-49	11/21/17	3,327	------------	Cable	8¼	36	3,320
	1-73	1/ 5/18	3.323	------------	Cable	8¾	36	3,320
	1-111	2/ 5/18	3,326	------------	Cable	8¼	36	3,320
	1-142	3/12/18	3,326	------------	Cable	8¼	36	3,320
	1-234	6/11/18	3,320	3,300	Cable	8¼	-----	3,300
	1-250	6/25/18	3,307	------------	Cable	8¼	-----	3,300
	1-190	5/ 1/18	4,050	Pumping test.	Cable	8¼	-----	3,254
Sec. 19, T. 3 S., R. 10 W., S. B.	1-81	1/14/18	3,626	------------	Cable	6¼	-----	3,620
	1-5	7/25/17	3,321	------------	Cable	8¼	-----	3,315
	1-189	5/ 1/18	4,110	Pumping test.	Cable	8¼	-----	3,300
Sec. 20, T. 3 S., R. 10 W., S. B.	1-233	6/10/18	4,382	Pumping test.	Cable	8¼	-----	3,626
Sec. 21, T. 3 S., R. 10 W., S. B.	1-13	8/15/17	4,354	------------	Cable	6¼	26-28	4,347
Sec. 22, T. 3 S., R. 10 W., S. B.	1-32	10/15/17	3.134	------------	Rotary	10	40	3.114
	1-46	11/ 9/17	3,492	------------	Cable	8¼	36	3,480
Sec. 23, T. 3 S., R. 10 W., S. B.	1-144	3/16/18	3,634	Pumping test.	Cable	6¼	26	3,125
	1-145	3/16/18	3.500	Pumping test.	Rotary	10	40	3.016
	1-27	9/15/17	3,015	------------	Rotary	10	40	3,000
	1-146	3/16/18	3,650	Pumping test.	Rotary	10	40	3.005
	1-20	9/ 1/17	2.912	------------	Rotary	10	40-45	2,894
	1-154	3/22/18	2,543	------------	Rotary	10	-----	2,523
	1-63	12/11/17	2,416	------------	Rotary	10	40-45	2,406
Sec. 24, T. 3 S., R. 10 W., S. B.	1-225	6/ 3/18	2,546	------------	Rotary	10	-----	2,521
	1-107	10/26/17	2,535	Pumping test.	Rotary	10	40-45	2,500
	1-175	4/22/18	3,723	------------	Rotary	6½	-----	3,723
Sec. 24, T. 3 S., R. 11 W., S. B.	1-6	7/25/17	3,610	------------	Rotary	6¾	-----	3,600
	1-64	12/12/17	3,740	------------	Cable	6¼	28	3,734
	1-220	5/23/18	3,925	Pumping test.	Rotary	8¼	-----	3,342
	1-125	2/20/18	4,267	------------	Cable	8¼	36	3,460

NUMBER ONE; see page 110.

Shut-off			Result	
Cement				
Number sacks	Method	Formation shut-off	Success	Failure
250	Perkins		Bailed to 2,200′. 7 gals. water from 2,200′.	
250	Tubing		Bailed to 2,000′. 4 gals. water from 2,000′.	
250	Tubing			125′ water, 1 hour.
30	Perkins		Bailed to 2,036′. 4 gals. water in 25 hours.	
10	Perkins			3 barrels water, 24 hrs.
90	Perkins			160′ water, 23 hours.
20	Perkins			575′ water, 18 hours.
70	Perkins			564′ water, 22½ hours.
40	Perkins		Hole bailed to 2,507′ for test. 6 gals. water from 2,523′.	
40	Perkins		Hole bailed to 2,508′ for test. 5 gals. water from 2,508′.	
80	Perkins		Hole bailed to 2,500′. 6′ water from 2,500′.	
70	Perkins			229′ water, 25 hours.
40	Recement Perkins			388′ water, 18 hours.
70	Recement tubing, 100# pressure.			260′ water, 23 hours.
40	Recement tubing, 1,200# pressure.			100′ water, 21 hours.
70	Perkins			329′ water, 55 hours.
30	Recement tubing, 1,275# pressure.			121′ water, 55 hours.
70	Perkins		.4% emulsion. No. free water.	
40	Perkins		Bailed to 2,500′. No rise in 23 hours.	
70	Perkins		Bailed to 2,500′. No rise in 18 hours.	
80	Perkins		Averaged less than .4% water.	
100	Perkins		3,924 bbls. per day of oil; no water.	
150	Tubing		Bailed to 2,497′. Rise 9′ in 12½ hours.	
250	Tubing		Bailed to 2,397′. No change in fluid level.	
70	Perkins		Bailed to 2,500′. No rise in fluid level.	
100	Tubing		200 bbls. fluid; .4% water.	
300	Tubing		176 bbls. fluid; .3% water.	
250	Tubing		Bailed to 2,400′. No change in fluid level.	
250	Tubing		182 bbls. fluid. 1.5% emulsion.	
300	Perkins		Fluid bailed to 1,800′. No change in fluid level.	
250	Perkins		3′ rise in 24½ hours.	
250	Perkins		2′ rise in 22½ hours.	
250	Perkins		Sample from 2,519′ showed 1% water.	
300	Perkins		116 bbls. fluid; no water.	
200	Tubing			602′ water, 21 hours.
15	Recemented through tubing.			Fluid carried water in suspension.
50	Perkins		23 gals. water in 11½ hours.	
12	Dumped			162 bbls. fluid; 1% water.
70	Perkins			Unable to lower fluid.

TABLE I. DISTRICT

Field, section, township, range, or lease	"T" report		Depth of hole		Water string			
						Casing		
	Number	Date	Total drilled (feet)	Bridged to (feet)	Tools	Diam. (inches)	Weight (pounds)	Length (feet)
Newhall—								
Sec. 6, T. 3 S., R. 15 W., S. B.	1-70	12/17/17	500	353	Cable	12½	-----	353
	1-1003	5/11/18	913	------------	Cable	10	40	911
Sec. 7, T. 3 S., R. 15 W., S. B.	1-16	8/23/17	474	------------	Cable	8¼	28	470
Sec. 18, T. 3 S., R. 15 W., S. B.	1-1000	3/ 4/18	600	594	Cable	8¼	28	517
	1-1002	4/ 4/18	600	561	Cable	8¼	28	545
Newhall—								
Sec. 16, T. 3 S., R. 16 W., S. B.	1-8	7/31/17	216	------------	Cable	6⅝	20	210
	1-30	10/13/17	146	------------	Cable	6⅝	20	143
	1-35	10/18/17	167	------------	Cable	6⅝	20	167
	1-43	11/ 3/17	232	------------	Cable	4½	15	232
Montebello—								
Sec. 31, T. 1 S., R. 11 W., S. B.	1-238	6/17/18	-------	------------	Rotary	12½	-----	2,185
	1-204	5/14/18	1,102	------------	Rotary	12½	-----	1,100
	1-222	5/29/18	2.316	2,308	Cable	10	-----	2,308
Sec. 6, T. 2 S., R. 11 W., S. B.	1-21	9/ 6/17	1,605	1,580	Rotary	12½	45	1,580
	1-210	5/16/18	3,110	Pumping test.	Rotary	12½	45	1,360
	1-92	1/23/18	1.207	------------	Rotary	12½	45	1,200
	1-119	2/12/18	1,205	------------	Rotary	12½	45	1,200
	1-157	3/27/18	1,693	------------	Cable	10	-----	1,688
	1-133	3/ 6/18	1.761	------------	Rotary	12½	45	1,755
	1-78	1/ 9/18	1,706	------------	Cable	10	-----	1,701
	1-110	2/ 5/18	1,706	------------	Cable	10	-----	1.701
	1-159	3/29/18	1,706	1,554	Cable	10	-----	1,549
	1-237	6/15/18	1,796	------------	Cable	8¼	-----	1,776
	1-230	6/ 7/18	1.890	------------	Rotary	12½	-----	1,874
	1-36	10/18/17	1,284	------------	Cable	10	45	1,261
	1-169	4/ 9/18	1,820	------------	Rotary	10	-----	1,815
Sec. 6, T. 2 S., R. 11 W., S. B.	1-178	4/24/18	2,291	------------	Rotary	10	45	2,286
	1-33	10/16/17	1.696	------------	Cable	8¼	-----	1,695
	1-97	1/24/18	1.313	------------	Rotary	12½	40	1,307
	1-129	3/ 1/18	1,824	------------	Rotary	10	-----	1,820
	1-138	3/ 7/18	2,223	Pumping test.	Rotary	12½	40	1,236
	1-181	4/25/18	1,973	1,960	Rotary	12½	45	1,960
Sec. 35, T. 1 S., R. 12 W., S. B.	1-82	1/17/18	1,673	1,598	Rotary	12½	-----	1,598
	1-152	3/22/18	1,464	------------	Cable	12½	40	1,441
	1-244	6/22/18	2,486	2,477	Cable	8¼	-----	2,477
Sec. 1, T. 2 S., R. 12 W., S. B.	1-2	7/24/17	2,185	2.125	Rotary	10	45	2,125
	1-3	7/21/17	2,083	2,030	Rotary	12½	45	2,030
	1-31	9/24/17	2.110	1,970	Rotary	12½	45	1,970
	1-243	6/18/18	2,174	------------	Rotary	12½	-----	2,170
	1-79	1/ 9/18	1,930	1,923	Rotary	12½	45	1,918

NUMBER ONE—Continued.

Shut-off			Result	
Cement				
Number sacks	Method	Formation shut-off	Success	Failure
58	Pumped through tubing.			139′ water raised in 23 hours.
60	Scott		12 gals. water in 20 hours.	
		Drove 20′ into blue shale.	Bailer brought up 3 gals. water off bottom.	
		Driven 8′ in blue shale.		243′ water, 49 hours.
15	Dump bailer; pressure.		7′ muddy water in 25 hours.	
		Driven in brown shale.		11½′ water in 20 hours.
		Driven in brown shale.		90′ water in 18½ hours.
		Driven in shale.	3′ water in 21 hours.	
		Driven 1′ 6″ in brown shale.	3′ water in 27 hours.	
	Perkins		No free water.	
200				92′ water in 15 hours
300	Huber & Wilson		10 gals. fluid: 1 qt. oil.	
280	Perkins		20′ mud left in hole. Bailer showed 25′ fluid.	
280	Perkins		Pumping test averaged .2% water.	
200	Perkins			332′ water in 16 hours.
200	Recemented tubing, 800# pressure.			233′ water in 17 hours.
120	Perkins		Bailed to 1,500′. 5 gals. water.	
300	Perkins		8′ oil, 1′ water in 13½ hours.	
60	Perkins			233′ water in 19 hours.
60	Recemented tubing, 800# pressure.			270′ water in 15 hours.
60	Perkins		7′ water in 13¾ hours.	
80	Perkins		Fluid at bottom .4% water.	
200	Perkins			30′ water in 7 hours.
		Blue shale		51 gals. water, 25 hrs.
200	Huber & Wilson, 250# pressure.		234′ oil and no free water.	
200	Huber & Wilson		No free water.	
50	Perkins		No free water.	
500	Huber & Wilson			181′ water in 13½ hrs.
200	Huber & Wilson, 300# pressure.		3 gals. muddy water.	
150	Huber & Wilson			115 bbls. fluid: 150 bbls. water per day.
250	Perkins		Rise of 21′ of fluid in 14 hours. 20% water.	
40	Recemented tubing, 600# pressure.			Water came in at rate of 100′ per hour.
200	Perkins			122′ water in 13 hours
400	Waggle & Scott		No change in fluid level. Well bailed to 2,015′.	
140	Perkins		Well bailed to 1,500′ for test. Showed 5′ water at test.	
290	Perkins		Bailed to 1,513′ for test, showed 4 gals. water above 1,513′.	
320	Perkins			Oil and water mixed.
300	Perkins		3′ oil, 5′ water, 17 hours.	
100	Recemented tubing, 900# pressure.			1′ oil, [illegible] water, [illegible] hrs.

TABLE I. DISTRICT

Field, section, township, range, or lease	"T" report		Depth of hole		Water string			
						Casing		
	Number	Date	Total drilled (feet)	Bridged to (feet)	Tools	Diam. (inches)	Weight (pounds)	Length (feet)
Montebello—Continued.								
Sec. 1, T. 2 S., R. 12 W., S. B.	1-58	12/ 6/17	1,990	1,918	Rotary	12½	45	1,918
	1-105	1/31/18	1,922	1,918	Rotary	12½	45	1,918
	1-123	2/16/18	1,925	------------	Rotary	12½	45	1,918
	1-150	3/22/18	1,990	1,970	Cable	10	-----	1,970
	1-53	11/27/17	2,125	2,105	Rotary	12½	-----	2,105
	1-93	1/23/18	2,125	2.105	Rotary	12½	-----	2,105
	1-118	2/12/18	-------	2,105	Rotary	12½	-----	2,105
	1-167	4/12/18	2,135	2,110	Cable	10½	-----	2,110
	1-216	5/23/18	2,125	2,115	Cable	10	-----	2,110
Sec. 1, T. 2 S., R. 12 W., S. B.--	1-136	3/ 7/18	2,227	2,221	Cable	10	-----	2,175
	1-165	4/ 8/18	2,195	2,185	Cable	10	-----	2,175
	1-195	5/ 6/18	2.220	------------	Cable	8¼	-----	2,215
	1-72	12/31/17	2,070	2,055	Rotary	12½	45	2,055
	1-212	5/17/18	2,193	------------	Cable	10	-----	2,188
	1-205	5/14/18	2,218	2,190	Rotary	12½	-----	2,190
	1-240	6/18/18	2,560	Pumping test.	Rotary	10	40	2,195
	1-196	5/ 8/18	2,340	------------	Cable	8¼	-----	2,329
	1-86	1/18/18	2,275	2,247	Rotary	10	-----	2,247
	1-102	1/28/18	2,258	2,246	Rotary	10	-----	2,246
	1-241	6/18/18	2,564	Pumping test.	Rotary	10	-----	2,301
	1-108	2/ 5/18	2,211	2,194	Rotary	10	-----	2,194
	1-224	5/31/18	2,720	------------	------------	10	-----	2,718
Sec. 2, T. 2 S., R. 12 W., S. B.--	1-89	1/19/18	2,465	2,430	Cable	8¼	-----	2,430
	1-75	1/ 5/18	2,067	------------	Rotary	12½	50	2,062
	1-163	4/ 8/18	2,523	2,514	Cable	10	-----	2,514
Whittier—								
Sec. 15, T. 2 S., R. 11 W., S. B.--	1-57	12/ 4/17	821	813	Cable	12½	40	813
Sec. 22, T. 2 S., R. 11 W., S. B.--	1-15	9/22/17	1,336	Casing froze.	Cable	10	40	1,315.
	1-128	1/14/18	2.642	------------	Cable	6¼	-----	2,599
	1-252	6/27/18	2.610	------------	Cable	6¼	-----	2,599
	1-7	7/30/17	1.144	------------	Cable	12½	45	1,132
	1-251	7/27/18	1,081	------------	Cable	15½	-----	1,075
	1-62	12/11/17	1.458	------------	Cable	12½	45	1,445
Sec. 25, T. 2 S., R. 11 W., S. B.--	1-131	3/ 2/18	1,854	------------	Cable	12½	45	1,847
	1-246	6/26/18	2.450	------------	Cable	10	40	2,450
Whittier—								
Sec. 26, T. 2 S., R. 11 W., S. B.--	1-1	7/11/17	2,125	------------	Cable	8¼	36	2,111
	1-10	8/23/17	2,440	2,377	Cable	8¼	36	2,377
	1-25	9/15/17	2,175	------------	Cable	10	45	2,162
	1-14	9/15/17	1,714	1.687	Cable	12½	45	1,687
	1-56	12/ 1/17	2,306	2,228	Cable	10	-----	2,228
	1-98	1/24/18	2,264	2,135	Cable	8¼	-----	2,135
	1-151	3/22/18	1,550	1,535	Cable	12½	45	1,534
	1-173	4/20/18	1,787	------------	Cable	10	-----	1,781
	1-213	5/18/18	1,818	1,784	Cable	10	-----	1,784
	1-191	5/ 8/18	1,996	1,966	Cable	12½	-----	1,964
	1-217	5/23/18	1,996	1,966	Cable	12½	-----	1,964
	1-184	4/26/18	1,900	1,870	Cable	12½	45	1,869
	1-221	5/29/18	1,900	1,870	Cable	12½	45	1,869
Sec. 16, T. 1 S., R. 14 W., S. B.--	1-212	6/21/18	1,267	1,248	Cable	8¼	-----	1.208

NUMBER ONE—Continued.

Shut-off			Result	
Cement				
Number sacks	Method	Formation shut-off	Success	Failure
320	Perkins			104′ fluid—20% water.
80	Recemented through tubing.			31′ water in 20 hours.
60	Recemented tubing, 900# pressure.			36′ water in 17 hours.
80	Perkins		2 gals. free water.	
	Perkins			25′ water in 26½ hours.
70	Recement through tubing.			180′ water in 21½ hrs.
70	Recemented tubing, 700# pressure.			215′ water in 17 hours.
80	Perkins			350′ water in 15 hours.
120	Recemented tubing, 500# pressure.			3 bbls. water per hour.
60	Perkins			170′ water in 2¼ hours.
80	Perkins			409′ water in 15 hours.
56	Perkins		No free water.	
320	Perkins		8′ water in 10 hours.	
100	Perkins		No free water.	
310	Perkins		5 gals. water from 2,199′.	
200	Union method		500 bbls. per day. .2% water.	
125	Union method		Fluid off bottom. 1% water.	
250	Tubing under pressure.			62′ water in 48 hours.
250	Tubing		3′ water in 14 hours.	
230	Tubing		500 bbls. per day. .2% water.	
250	Tubing		No free water.	
200	Huber & Wilson			Hole full of water.
150	Perkins		108′ oily mud, 18½ hours.	
150	Huber & Wilson		26 gals. water in 25 hours.	
140	Huber & Wilson			272′ water in 12 hours.
200	Perkins		2′ water off bottom.	
		Blue shale	Mud and oil in bailer. No free water.	
30	Recement tubing, 1,300# pressure.			Could not bail water down.
65	Perkins			360′ water in 17 hours.
200	Perkins			2′ water in 4 hours.
		Blue shale	No fluid entered hole in 26 hours.	
280	Perkins		17′ oil, mud and water in 34 hrs.	
330	Perkins			Casing collapsed at 1,325′ while bailing.
		Sticky blue shale.	No fluid entered well in 20 hours.	
115	Perkins		All oil; no free water.	
200	Perkins		All oil; no free water.	
135	Perkins		All oil; no free water from bottom.	
200	Perkins		19 gals. water in 19½ hours.	
130	Perkins		All oil: no free water.	
140	Perkins		326′ oil, 110′ oily mud. No free water in 24 hours.	
320	Perkins		3′ rise of water in 21½ hours.	
100	Perkins			Water level could not be lowered.
50	Recemented tubing, 750# pressure.		2 bbls. water in 26 hours.	
100	Perkins			10′ water in 6 hours.
65	Recemented tubing			23 bbls. water in 27 hrs.
400	Perkins			5 bbls. water in 21 hrs.
62	Recemented through tubing.			6¼ bbls. water in 27½ hours.
75			No free water during test.	

TABLE I. DISTRICT

Field, section, township, range, or lease	"T" report		Depth of hole		Water string			
						Casing		
	Number	Date	Total drilled (feet)	Bridged to (feet)	Tools	Diam. (inches)	Weight (pounds)	Length (feet)
Puente—								
T. 2 S., R. 10 W., S. B.	1 140	3/ 8/18	2,906	------------	Cable	8¼	32-36	2,990
Olinda—								
Sec. 8, T. 3 S., R. 9 W., S. B.	1-69	12/ 5/17	1,182	------------	Cable	10	-----	1,171
	1-23	9/ 6/17	1,276	------------	Cable	12½	40	1,245
	1-34	10/17/17	1,029	------------	Cable	12½	45	988
	1-113	2/ 6/18	994	961	Cable	12½	-----	961
	1-209	5/15/18	1,090	------------	Cable	12½	-----	1,086
	1-219	5/24/18	1,095	------------	Cable	12½	-----	1,086
	1-228	6/ 4/18	854	831	Cable	12½	-----	831
	1-218	5/23/18	2,332	2,290	Cable	8¼	-----	2,290
	1-155	3/22/18	2,295	2,234	Cable	10	-----	2,234
Sec. 8, T. 3 S., R. 9 W., S. B.	1-18	8/30/17	2,805	2,795	Cable	8¼	32	2,795
	1-120	2/12/18	2,485	------------	Cable	10	40	2,465
Sec. 7, T. 3 S., R. 9 W., S. B.	1-253	6/28/18	3,328	3,280	Cable	8¼	-----	3,280
Brea Canyon—								
Sec. 2, T. 3 S., R. 9 W., S. B.	1-156	3/26/18	2,312	------------	Cable	10	-----	2,304
	1-200	5/10/18	882	------------	Rotary	15½	-----	877
Miscellaneous—								
Sec. 19, T. 1 S., R. 12 W., S. B.	1-161	4/ 8/18	1,545	1,528	Cable	9⅝	-----	1,528
Sec. 25, T. 1 S., R. 13 W., S. B.	1-42	11/ 2/17	1,648	1,636	Cable	10	-----	1,636

NUMBER ONE—Continued.

Shut-off			Result	
Cement				
Number sacks	Method	Formation shut-off	Success	Failure
60	Huber & Wilson		15′ water in 16¼ hours.	
100	Scott		40′ oil, no water in 5 hours.	
		Shale	All oil, no free water brought off bottom.	
		Driven 100′ brown shale.	Bailer brought all oil, no free water.	
100	Scott		1′ water in 23 hours.	
120	Huber & Wilson			454′ water in 16 hours.
30	Recemented, Huber & Wilson.			425′ water in 17 hours.
100	Huber & Wilson		Mud and oil; no free water.	
100	Perkins		No free water in fluid taken from bottom.	
150	Perkins		No change in fluid.	
150			4 gals. water in 22½ hours.	
150	Perkins		Rise of 5′ fluid in 29½ hours.	
125	Tubing method			218′ water in 27½ hours.
350	Scott		Fluid bailed to 1,500′, 5′ rise in fluid in 21 hours.	
400	Scott		Fluid bailed to 800′, 6″ rise in fluid in 20 hours.	
100	Perkins			Unable to bail fluid below 475′.
150	Perkins		Hole filled 9′ with water in 24½ hours.	

TABLE II. DISTRICT

Field, section, township, range, or lease	"T" report		Depth of hole		Water string			
						Casing		
	Number	Date	Total drilled (feet)	Bridged to (feet)	Tools	Diam. (inches)	Weight (pounds)	Length (feet)
Ventura—								
Sec. 21, T. 3 N., R. 23 W., S. B.	2-70	6/29/18	2,146	------------	Cable	10	45	2,146
	2-30	1/11/18	2,996	Pumping test.	Cable	8¼	32	2,986
Ojai—								
Sec. 17, T. 4 N., R. 21 W., S. B.	2-14	10/12/17	1,010	Pumping test.	Cable	9⅝	28	447
Sec. 12, T. 4 N., R. 21 W., S. B.	2-11	9/11/17	672	------------	Cable	8¼	28	664
Santa Paula—								
Sec. 22, T. 4 N., R. 21 W., S. B.	2-31	1/17/18	602	------------	Cable	10	40	589
Sec. 18, T. 4 N., R. 20 W., S. B.	2-49	4/ 5/18	940	------------	Cable	9⅝	-----	335
Sec. 20, T. 4 N., R. 20 W., S. B.	2-46	3/11/18	665	------------	Cable	10	40	585
South Mountain—								
Sec. 13, T. 3 S., R. 21 W., S. B.	2-12	9/15/17	2,092	------------	Cable	10	40-45	2,081
	2-7	9/ 5/17	898	887	Cable	12½	40	887
	2-63	5/27/18	882	875	Cable	12½	40	875
Sec. 18, T. 3 N., R. 20 W., S. B.	2-52	4/26/18	751	------------	----------	12½	-----	738
	2-17	10/25/17	1,487	Pumping test.	Cable	10	40	544
	2-8	9/ 5/17	589	573	Cable	12½	40	573
	2-69	6/26/18	738	------------	Cable	12½	40	730
	2-53	4/26/18	641	630	Cable	12½	40	630
	2-24	12/21/17	589	------------	Cable	10	40	577
Sec. 19, T. 3 N., R. 20 W., S. B.	2-28	1/ 9/18	1,093	------------	Cable	10	40	1,078
Sec. 17, T. 3 N., R. 20 W., S. B.	2-5	8/16/17	810	744	Cable	10	40	744
	2-22	12/17/17	2,030	1,934	Cable	6¾	-----	1,934
Sespe—								
Sec. 1, T. 4 N., R. 20 W., S. B.	2-56	5/16/18	529	------------	Cable	8	-----	302
Sec. 35, T. 5 N., R. 19 W., S. B.	2-6	8/27/17	1,051	------------	Cable	9⅝	-----	873
Sec. 23, T. 5 N., R. 20 W., S. B.	2-39	2/11/18	490	------------	Cable	15½	70	481
	2-50	4/ 5/18	800	------------	Cable	12½	-----	795
Bardsdale—								
Sec. 4, T. 3 N., R. 19 W., S. B.	2-44	3/ 4/18	3,458	3,437	Cable	6¼	-----	3,435
	2-2	7/18/17	2,792	Pumping test.	Cable	6¾	-----	2,749
	2-4	7/25/17	763	------------	Cable	12½	40	759
	2-9	9/ 5/17	1,246	------------	----------	10	-----	1,234
	2-10	9/11/17	351	------------	----------	15½	70	332
	2-16	10/20/17	703	------------	----------	12½	40	694
	2-38	2/11/18	1,257	1,150	Cable	12½	40	1,150
	2-51	4/26/18	2,055	------------	Cable	10	-----	2,018
	2-19	11/21/17	3,379	------------	Cable	8¼	36	3,373
Sec. 3, T. 3 N., R. 19 W., S. B.	2-41	2/18/18	967	------------	Cable	12½	40	955
	2-33	1/30/18	1,440	1,402	Cable	10	40	1,402

NUMBER TWO; see page 110.

Shut-off			Result	
Cement				
Number sacks	Method	Formation shut-off	Success	Failure
56	Dump bailer	-----	Well bailed to 1,000' for test. No rise in fluid in 11½ hrs.	
23	Pumped through tubing, 800 lbs. pressure.	-----	32 bbls. fluid; no water.	
-----	-----	Landed in shale.	6 bbls. oil; no water per day.	
-----	-----	Driven 6' in small hole.	8 gals. water in 38 hours.	
-----	-----	Driven 16'	5 gals. oil; no water in 21½ hrs.	
-----	-----	Landed in blue shale.	Bailed at successive depths to 390', no free water.	
-----	-----	Driven 3' in brown shale.	Hole stood dry for 7 days.	
200	-----	-----	Water bailed to 1,800' for test. No rise in fluid in 16 hours.	
40	Dump bailer	-----	5 gals. mud in 15 hours.	
50	Dump bailer	-----	20 gals. mud in 14 hours.	
75	Dump bailer and pressure.	-----	1 qt. water in 27½ hours.	
-----	-----	Driven into shale.	22 bbls. oil per day; no water.	
50	Dump bailer and air pressure.	-----	3 gals. water in 23 hours.	
195	Pumped back of casing.	-----	3 gals. mud and water in 18 hrs.	
75	Dump bailer	-----	½ gal. fluid, 26 hours.	
50	Dump bailer	-----	5 gals. water in 14 hours.	
20	Dump bailer	-----	5 gals. mud, no oil, 12 hours.	
17	Dump bailer	-----	18' water in 12 hours. Bridge drilled out, 60' open hole.	
15	Dump bailer	-----	28' water in 19 hours. Water came through bridge.	
-----	-----	Driven into formation.	2 gals. water in 18 hours.	
-----	-----	Driven into formation.	3 gals. water in 7 hours.	
20	Dump bailer	-----	1 gal. water in 17½ hours.	
40	Dump bailer	-----	2 gals. water in 21 days.	
50	Tubing under pressure.	-----	-----	91.4 bbls. water in 7 hrs.
35	-----	-----	46 bbls. fluid, 1.6% water in 24 hours.	
20	Dump bailer	-----	-----	1' water per hour.
200	Pumped into tubing.	-----	No free water.	
30	Dump bailer	-----	8 gals. mud and water in 21 hrs.	
40	Dump bailer	-----	-----	2 bailers water in 26 hours.
200	Scott	-----	6 gals. water in 16 hours.	
160	Dump bailer	-----	1 qt. water in 11 hours.	
150	Perkins	-----	Hole bailed to 2,590'. Brought up 2 gals. water.	
-----	-----	Driven 12' in 10" hole; brown shale.	5 gals. water in 104 hours.	
25	Dump bailer	-----	10 gals. water in 25½ hours.	

TABLE II. DISTRICT

Field, section, township, range, or lease	"T" report		Depth of hole		Water string			
						Casing		
	Number	Date	Total drilled (feet)	Bridged to (feet)	Tools	Diam. (inches)	Weight (pounds)	Length (feet)
Simi—								
Sec. 36, T. 3 N., R. 18 W., S. B.	2-61	5/24/18	730	714	Cable	10	40	714
	2-65	6/ 5/18	385	------------	Cable	12½	40	316
	2-67	6/15/18	414	------------	Cable	12½	40	403
Sec. 35, T. 3 N., R. 18 W., S. B.	2-20	12/ 5/17	760	700	Cable	8¼	28	700
	2-40	2/14/18	1,064	1,045	Cable	8¼	28	1,045
	2-26	1/ 2/18	692	646	Cable	10	40	646
	2-37	2/11/18	623	------------	Cable	10	40	613
	2-43	2/25/18	523	------------	Cable	10	40	510
	2-60	5/24/18	695	------------	Cable	10	40	673
Sec. 35, T. 3 N., R. 18 W., S. B.	2-71	6/29/18	859	------------	Cable	10	40	841
Piru—								
Sec. 8, T. 4 N., R. 18 W., S. B.	2-18	11/14/17	866	------------	Cable	6¼	20	784
Sec. 36, T. 4 N., R. 18 W., S. B.	2-64	5/27/18	410	------------	Cable	12½	-----	403
Simi—								
Sec. 32, T. 3 N., R. 18 W., S. B.	2-15	10/18/17	1,370	1,205	Cable	12½	40-45	1,205
	2-27	1/ 9/18	1,920	------------	Cable	10	40	1,915

NUMBER TWO—Continued.

Shut-off			Result	
Cement		Formation shut-off	Success	Failure
Number sacks	Method			
50	Dump bailer, driven 6'.	----------	15' fluid in 56 hours.	
----	----------	Driven 7' in hard shale.	----------	270' water in 8 days.
----	----------	Driven 6' in 8" hole in shale.	2 gals. muddy water.	
40	Dump bailer----	----------	Bailer brought up about 3 gals. free water.	
60	Perkins ----	----------	5 gals. mud in 25½ hours.	
60	Perkins ----	----------	1 gal. mud in 26½ hours.	
----	----------	Driven 16" 8" hole.	1 gal. muddy water in 35 hours.	
----	----------	Driven 5' in 8" hole.	Bailer brought up 1 gal. mud, show of oil in 20 hours.	
----	----------	Driven 7' 6" into shale.	Bailer brought 2 gals. mud, no oil.	
----	----------	Driven 18" in blue shale.	----------	60 gals. water in 28 hours.
31	Dump bailer----	----------	2 gals. water off bottom.	
40	Scott ----	----------	Bailer brought up 2 gals. water.	
60	Dump bailer----	----------	Bailer came up half full of oil and mud.	
100	Perkins ----	----------	----------	100' water in 60 hrs.

TABLE III. DISTRICT

Field, section, township, range, or lease	"T" report		Depth of hole		Tools	Water string		
						Casing		
	Number	Date	Total drilled (feet)	Bridged to (feet)		Diam. (inches)	Weight (pounds)	Length (feet)
Arroyo Grande—								
Sec. 31, T. 31 S., R. 13 E., M. D.	3-77	1/12/18	719	------------	Cable	10	40	713
	3-45	11/ 5/17	608	------------	Cable	8¼	28-36	598
	3-80	2/ 5/18	735	------------	Cable	8¼	36	730
	3-34	9/24/17	785	745	Cable	10	35-40	745
	3-92	2/ 9/18	760	------------	Cable	10	40	745
Casmalia—								
Arrellanes Lease	3-116	5/14/18	947	------------	Cable	12½	40	940
	3-85	6/24/18	926	------------	Cable	12½	40	920
	3-98	2/20/18	1,453	------------	Cable	10	40-45	1,446
	3-29	9/10/17	862	------------	Cable	12½	40	857
	3-52	11/26/17	842	------------	Cable	12½	40	838
	3-79	1/17/18	1,450	1,330	Cable	10	40	1,330
	3-91	2/ 6/18	1,396	------------	Cable	10	40	1,390
	3-46	11/ 6/18	834	------------	Cable	12½	40	820
	3-61	12/10/17	1,477	------------	Cable	10	40	1,472
	3-1	7/ 2/17	1,379	------------	Cable	10	40	1,375
	3-64	12/27/17	847	------------	Cable	12½	40	840
	3-86	1/28/18	1,421	------------	Cable	10	40-45	1,416
	3-110	4/ 9/18	1,367	------------	Cable	10	40	1,362
Soladino Lease	3-25	8/31/17	1,150	1,100	Cable	12½	40	1,100
	3-16	8/16/17	1,595	1,524	Cable	10	40	1,524
	3-27	9/ 4/17	1,549	------------	Cable	10	40	1,545
	3-40	10/15/17	965	------------	Cable	12½	40	963
	3-94	2/ 9/18	1,030	------------	Cable	12½	40	1,030
	3-87	1/28/18	1,123	------------	Cable	10	40	1,119
	3-72	1/ 4/18	352	------------	Cable	12½	40	350
	3-75	1/ 9/18	919	------------	Cable	12½	40	917
	3-63	12/22/17	976	------------	Cable	12½	40	972
	3-7	7/31/17	1,066	------------	Cable	10	40	1,064
	3-57	12/ 8/17	973	958	Cable	10	40	958
	3-15	8/15/17	1,170	1,141	Cable	12½	40	1,142
Lease No. 1	3-58	12/ 8/17	1,125	1,040	Cable	10	40	1,040
	3-6	7/16/17	1,150	1,121	Cable	12½	40	1,116
	3-3	7/10/17	1,167	------------	Cable	12½	40	1,166
	3-69	1/ 2/18	921	------------	Cable	12½	40	919
	3-9	8/ 4/17	1,432	1,407	Cable	10	40	1,407
	3-50	11/20/17	1,000	------------	Cable	12½	45	993
	3-28	9/ 4/17	1,060	1,030	Cable	12½	40	1,030
	3-30	9/14/17	863	------------	Cable	12½	40	861
	3-37	10/ 3/17	1,242	------------	Cable	12½	40	1,240
Lease No. 2	3-19	8/27/17	2,060	1,910	Cable	10	40	1,910
	3-70	1/ 3/18	2,550	2,453	Cable	8¼	28	2,453
	3-127	6/17/18	850	------------	Cable	12½	40	396
	3-57	12/ 4/17	1,348	------------	Cable	12½	45	1,341
Sec. 3, T. 9 N., R. 35 W., S. B.	3-12	8/ 6/17	730	595	Cable	12½	38-40	576
	3-122	5/31/18	1,647	1,635	Cable	8¼	36	1,627

NUMBER THREE; see page 110.

Shut-off			Result	
Cement		Formation shut-off	Success	Failure
Number sacks	Method			
38	Tubing		2 gals. mud and water in 24 hrs.	
45	Tubing		2 gals. water in 22 hours.	
45	Tubing		5 gals. water in 45 hours.	
34	Tubing		½ bailer water and tar in 17 hrs.	
45	Tubing		2 gals. water in 19 hours.	
150	Perkins		6′ water in 19 hours.	
150	Perkins			215 gals. water in 12 hours.
150	Perkins		1 gal. water in 26 hours.	
100	Perkins		½ bailer water in 16 hours.	
100	Perkins		7′ water in 12 hours.	
100	Perkins		At end of 14 days pumped 400 bbls. fluid, 1.6% water.	
150	Perkins		5 gals. water in 17 hours.	
100	Perkins		12′ water in 19 hours.	
100	Perkins		1 gal. water in 18 hours.	
100	Perkins		Bailer full heavy oil; little water.	
100	Perkins		27 gals. water in 20 hours.	
150	Perkins		1 gal. water in 25 hours.	
100	Perkins		Few gals. muddy water in 24 hrs.	
225	Perkins			Well made 1½ bailers per hour.
125	Perkins		¾ bailer of water in 24 hours.	
120	Perkins		10 gals. water in 24 hours.	
200	Perkins		½ gal. water in 26½ hours.	
250	Perkins		½ bailer of water in 16 hours.	
100	Perkins		⅔ bailer of water in 15 hours.	
150	Perkins		3 gals. water in 25 hours.	
260	Perkins		5 gals. water in 6 hours.	
200	Perkins		Oil, mud and little water.	
100	Perkins		5 gals. water in 48 hours.	
200	Perkins		At the end of 60 days well produced 450 bbls.; 3.2% water.	
225	Perkins		½ bailer of water and oil.	
200	Perkins		At end of 30 days produced 400 bbls. fluid; 2.0% water.	
200	Perkins		½ bailer of water in 36 hours.	
200	Perkins		A few gals. water in 48 hours.	
200	Perkins		18 gals. water in 12 hours.	
325	Perkins			10 gals. water per hr.
200	Perkins		10′ of water in 10 days.	
225	Perkins		After successive bailing tests got no free water.	
200	Perkins		½ bailer water in 24 hours.	
225	Perkins		3 gals. water in 4 days.	
200	Perkins		½ bailer oil and water in 12 hrs.	
150	Perkins			25 gals. per hour through bridge.
		Temporary shut-off.	Hole stood dry for 15 hours.	
200	Perkins		7′ water in 23½ hours.	
40	Dump bailer		5 gals. water in 40 hours.	
22	Dump bailer			138 gals. water in 25 hours.

TABLE III. DISTRICT

Field, section, township, range, or lease	"T" report		Depth of hole		Water string			
						Casing		
	Number	Date	Total drilled (feet)	Bridged to (feet)	Tools	Diam. (inches)	Weight (pounds)	Length (feet)
Casmalia—Continued.								
Morganti Lease	3-114	4/27/18	965	------------	Cable	12½	40	960
	3-132	6/24/18	1,480	------------	Cable	10	40-45	1,472
	3-68	1/ 1/18	1,155	------------	Cable	12½	40	1,150
	3-102	3/11/18	1,687	------------	Cable	10	40-45	1,680
	3-44	10/30/17	1,105	------------	Cable	12½	40	1,100
	3-62	12/10/17	1,643	------------	Cable	10	40	1,638
	3-38	10/10/17	1,105	------------	Cable	12½	40	1,100
	3-54	11/30/17	1,040	------------	Cable	12½	40	1,035
	3-54	11/30/17	1,040	------------	Cable	12½	40	1,035
Peshine Lease	3-18	8/24/17	1,177	------------	Cable	12½	40	1,172
	3-55	11/30/17	1,188	------------	Cable	12½	40	1,180
	3-120	5/20/18	1,397	------------	Cable	10	40-45	1,390
	3-129	6/21/18	540	------------	Cable	12½	40	534
	3-119	5/20/18	1,426	------------	Cable	12½	40	1,421
	3-119	5/20/18	------	------------	Cable	15½	-----	455
	3-117	5/14/18	1,324	------------	Cable	12½	40	128
	3-125	6/12/18	1,329	------------	Cable	10	40-45	1,324
	3-10	8/ 4/17	1,035	------------	Cable	12½	40	1,030
	3-2	7/ 2/17	1,169	1,136	Cable	12½	40	1,136
Escolle Lease	3-56	12/ 1/17	1,181	------------	Cable	12½	40	1,178
	3-101	2/26/18	1,470	------------	Rotary	10	40	1,465
	3-26	9/ 3/17	1,510	------------	Cable	12½	40	1,488
	3-95	2/11/18	1,430	------------	Rotary	10	40	1,423
	3-100	2/27/18	1,453	------------	Rotary	10	40	1,440
	3-123	6/ 1/18	1,316	------------	Rotary	10	36-40	1,310
Newhall Lease	3-32	9/17/17	595	------------	Cable	15½	70	593
	3-49	11/19/17	1,618	------------	Cable	12½	45	1,601
	3-97	2/18/18	2,797	------------	Cable	10	45	2,795
Santa Maria— Graciosa Lease	3-66	12/28/17	3,310	Pumping test.	Cable	8¼	36	3,304
	3-29	8/29/17	4,065	Pumping test.	Cable	4½	----	3,632
	3-21	8/29/17	3,306	Pumping test.	Cable	6¼	-----	3,296
	3-96	2/18/18	3,574	Pumping test.	Cable	6¼	-----	3,554
	3-22	8/31/17	416	------------	Cable	12½	40	396
	3-90	2/ 4/18	3,468	------------	Cable	8¼	26	3,456
Careaga Lease	3-36	10/ 1/17	461	------------	Cable	12½	40	453
	3-74	1/ 5/18	2,400	------------	Cable	10	40	2,392
	3-112	4/25/18	405	------------	Cable	12½	40	401
	3-118	5/18/18	396	------------	Cable	12½	40	390
	3-128	6/19/18	582	------------	Cable	12½	40	577

NUMBER THREE—Continued.

Shut-off			Result	
Cement				
Number sacks	Method	Formation shut-off	Success	Failure
150	Perkins			35 gals. water in 3 hrs.
200	Perkins		10 gals. water in 12 hours.	
100	Perkins		72 gals. water in 20 hours.	
150	Perkins		6′ water in 12 hours.	
100	Perkins		5 gals. water in 15½ hours.	
100	Perkins		50 gals. drilling water in 12 hrs.	
100	Perkins		5′ water in 13 hours.	
100	Perkins			Company reported no job.
50	Recemented Perkins.			11½ bailers water in 20 hours.
147	Perkins		Hole stood dry 15 hours.	
150	Perkins		5 gals. water in 9 hours.	
150	Perkins		Drilling water returned; 36 gals. water in 12 hours.	
150	Perkins		5 gals. water in 15 hours.	
150	Perkins		Water bailed to 1,187′; no increase in fluid level.	
	Perkins			Company stated job a failure.
		Driven 20′ in blue shale.	Temporary shut-off for prospecting; hole dry 25 hours.	
150	Perkins		Hole stood dry 12 hours.	
200	Perkins		After drilling ahead 50′, well stood dry 10 hours.	
100	Perkins		½ bailer mud, water and oil in 25 hours.	
300	Perkins		3 gals. water in 20 hours.	
250	Perkins		⅓ bailer water in 22½ hours.	
200	Tubing		⅓ bailer oil and water in 24 hrs.	
250	Perkins		4 gals. water and oil in 12 hrs.	
250	Perkins		10 gals. water and oil in 16 hrs.	
200	Perkins		Hole stood dry 12½ hours.	
56	Dump bailer		1 qt. water in 22 hours.	
56	Dump bailer		Hole bailed to 800′; raised 3′ water in 33 hours.	
42	Dump bailer		Hole bailed to 2,000′; raised 4′ in 33 hours.	
250	Perkins		Well pumped 25 bbls. fluid, .8% water.	
	Tubing		Fluid pumped 3.8% water.	
	Tubing			26% water after pumping 10 days
250	Perkins		½ bbl. water at end of 4 days.	
		Landed in blue clay.	1 gal. water in 17 hours.	
250	Perkins		Fluid bailed to 2,802′. No change in level.	
		Landed in blue shale.	Bailed dry. No water after 16 hours.	
100	Perkins		Water bailed to 1,807′. ½ bailer water from 1,807′.	
		Landed in blue shale.	1 gal. mud after 12½ hours.	
		Landed in blue shale.	5 gals. mud after 12 hours.	
		Landed in blue shale.	2 gals. mud after 16 hours.	

TABLE III. DISTRICT

Field, section, township, range, or lease	"T" report		Depth of hole		Water string			
						Casing		
	Number	Date	Total drilled (feet)	Bridged to (feet)	Tools	Diam. (inches)	Weight (pounds)	Length (feet)
Santa Maria—Continued.								
Newlove Lease	3-23	9/ 6/17	3,740	3,717	Cable	6¼	-----	3,717
	3-43	10/27/17	3,312	------------	Cable	6¼	-----	3,298
Sec. 26, T. 9 N., R. 34 W., S. B.	3-65	12/28/17	3,295	Pumping test.	Cable	6¼	26	3,235
	3-4	7/11/17	3,584	------------	Cable	6¼	26	3,584
Cat Canyon—								
Sec. 30, T. 9 N., R. 32 W., S. B.	3-31	9/15/17	2,100	------------	Rotary	10	36	2,095
	3-73	1/ 5/18	2,120	------------	Rotary	10	40	2,115
Sec. 31, T. 9 N., R. 32 W., S. B.	3-105	3/15/18	2,196	------------	Rotary	10	40	2,190
	3-47	11/ 8/17	1,657	------------	Cable	8¼	28	1,652
	3-81	1/18/18	2,027	------------	Cable	6¼	26	2,025
Sec. 23, T. 9 N., R. 33 W., S. B.	3-113	4/25/18	2,524	------------	Cable	6¼	-----	2,512
	3-17	8/16/17	2,872	------------	Cable	8¼	28	2,870
Sec. 26, T. 9 N., R. 33 W., S. B.	3-78	1/14/18	1,191	------------	Rotary	12½	40	1,184
	3-106	3/30/18	2,700	------------	Rotary	8¼	36	2,696
	3-35	9/29/17	2,855	------------	Rotary	8¼	36	2,851
Bell Lease	3-41	10/25/17	3,075	3,066	Cable	8¼	32	3,066
	3-13	8/15/17	3,147	3,087	Cable	8¼	32	3,119
	3-11	8/ 4/17	2,795	2,750	Cable	8⅝	48	2,736
	3-24	9/ 5/17	3,010	------------	Rotary	11	60	3,004
	3-53	11/27/17	3,515	3,490	Cable	8¼	32	3,490
	3-121	5/26/18	3,960	3,954	Cable	8¼	32	3,954
	3-107	4/ 3/18	3,668	3,601	Cable	6¼	26	3,601
	3-14	8/15/17	2,619	2,614	Rotary	10	40	2,614
	3-39	10/12/17	2,592	2,576	Rotary	10	40	2,576
Los Alamos	3-5	7/12/17	3,465	3,438	Cable	8¼	36	3,438
	3-33	9/21/17	3,356	------------	Cable	8¼	36	3,351
	3-76	1/11/18	493	------------	Rotary	15½	70	490
	3-88	1/30/18	2,627	------------	Rotary	10	45	2,622

NUMBER THREE—Continued.

Shut-off			Result	
Cement		Formation shut-off	Success	Failure
Number sacks	Method			
250	Pumped through casing.	--------------	120 bbls. of fluid; 5% water at end of 12 days.	
250	Pumped through casing.	--------------	Bailer brought oil off bottom; very little water.	
250	Perkins	--------------	200 bbls. fluid; .6% water.	
250	Tubing	--------------	Water bailed to 2,856′; no change in fluid level.	
200	Perkins	--------------	Water bailed to 1,540′; no change in fluid level in 13 hours.	
250	Perkins	--------------	3 gals. water in 22½ hours.	
550	Perkins	--------------	Water bailed to 1,230′; no change in fluid in 17 hours.	
150	Pumped into casing	--------------	------------------------------------	73′ water in 28 hrs.
221	Perkins	--------------	6 gals. water in 12 hours.	
120	Perkins	--------------	Water bailed to 1,700′; no change in fluid level in 18 hours.	
120	Perkins	--------------	Hole bailed to 2,100′; no change in fluid level in 18 hours.	
299	Perkins	--------------	Bailed to 887′; no change in fluid level.	
221	Perkins	--------------	Hole bailed to 1,523′; no change in fluid in 17 hours.	
250	Tubing	--------------	1 qt. of water in 17 hours.	
100	Tubing	--------------	3′ water in 12 hours.	
120	Tubing	--------------	5 gals. water in 12 hours.	
100	Tubing	--------------	1 bailer of water in 24 hours.	
100	Tubing	--------------	2 gals. water in 13 hours.	
60	Tubing	--------------	------------------------------------	300′ water in 24 hrs.
150	Tubing	--------------	5 gals. water in 27 hours.	
150	Tubing	--------------	10 gals. oily mud in 18 hours.	
250	Tubing	--------------	A few gals. water in 18 hours.	
250	Tubing	--------------	No water in 22½ hours.	
65	Perkins	--------------	Bailed to 2,370′; no change in fluid level.	
80	Perkins	--------------	Bailed to 2,400′; no change in fluid in 26 hours.	
50	Perkins	--------------	Hole stood dry 2 days.	
200	Perkins	--------------	Hole bailed to 2,100′; no change in fluid.	

TABLE IV. DISTRICT

Field, section, township, range, or lease	"T" report		Depth of hole		Water string			
						Casing		
	Number	Date	Total drilled (feet)	Bridged to (feet)	Tools	Diam. (inches)	Weight (pounds)	Length (feet)
Lost Hills—								
Sec. 3, T. 26 S., R. 20 E., M. D.	4-534	7/ 9/17	665	------------	Cable	12½	40	657
	4-599	8/14/17	1,210	------------	Cable	10	-----	1,201
	4-1014	2/18/18	2,555	------------	Cable	8¼	-----	2,540
Sec. 11, T. 26 S., R. 20 E., M. D.	4-540	7/19/17	964	------------	Cable	10	-----	961
	4-838	12/ 5/17	736	709	Cable	10	-----	709
Sec. 19, T. 26 S., R. 21 E., M. D.	4-1032	2/21/18	522	------------	Cable	10	-----	520
	4-1238	5/ 7/18	385	------------	Cable	10	-----	367
	4-1277	5/22/18	495	------------	Cable	10	-----	437
	4-1352	6/18/18	725	------------	Cable	8¼	-----	709
	4-1353	6/18/18	804	------------	Cable	8¼	-----	800
Sec. 29, T. 26 S., R. 21 E., M. D.	4-668	9/17/17	672	------------	Cable	10	40	665
	4-848	12/ 9/17	715	704	Cable	10	40	698
	4-634	8/27/17	690	------------	Cable	8¼	-----	681
	4-921	1/11/18	680	------------	Cable	10	40	672
Belridge—								
Sec. 26, T. 27 S., R 20 E., M. D.	4-672	9/17/17	4,136	------------	Cable	6¼	-----	4,131
	4-750	10/23/17	4,321	------------	Cable	4½	-----	4,316
	4-571	8/ 2/17	1,951	------------	Cable	12½	-----	1,947
Sec. 35, T. 27 S., R. 20 E., M. D.	4-1108	3/21/18	4.255	------------	Cable	6¼	-----	4,248
	4-710	10/ 4/17	3,982	------------	Cable	8¼	-----	3,961
Sec. 36, T. 27 S., R. 20 E., M. D.	4-503	7/ 7/17	4,189	------------	Cable	6¼	26	4,183
	4-1073	3/ 6/18	710	Pumping test.	Cable	10	35	525
	4-1160	4/10/18	570	------------	Cable	10	35	560
	4-1160	4-10-18	540	------------	Cable	10	35	540
	4-1269	5/21/18	691	------------	Cable	8¼	28	684
	4-1070	3/ 6/18	710	------------	Cable	10	35	608
Sec. 36, T. 27 S., R. 20 E., M. D.	4-1225	5/ 1/18	720	------------	Cable	8¼	28	705
	4-1225	5/ 1/18	702	678	Cable	10	35	678
	4-1109	3/21/18	665	------------	Cable	10	35	661
Sec. 5, T. 27 S., R. 21 E., M. D.	4-996	2/ 7/18	1,515	------------	Cable	8¼	-----	1,510
	4-800	11/23/17	1,314	------------	Cable	8¾	-----	1,308
Sec. 28, T. 28 S., R. 21 E., M. D.	4-1236	5/ 7/18	685	Pumping test.	Cable	8¼	28	685
	4-729	10/13/17	2,660	Pumping test.	Cable	8¾	28	2,578
	4-677	9/21/17	2,629	------------	Cable	8¼	28	2,624
	4-768	10/31/17	3,061	------------	Cable	6¼	-----	3,061
	4-1056	3/ 3/18	3,302	------------	Cable	4¾	-----	3,296
	4-654	9/10/17	749	------------	Cable	12½	-----	746
	4-1291	5/24/18	4,003	------------	Cable	6¼	-----	3,993
Sec. 1, T. 29 S., R. 21 E., M. D.	4-968	1/ 8/18	814	------------	Cable	12½	-----	810
	4-1146	4/ 2/18	1,250	859	Cable	10	-----	851
	4-1146	4/ 2/18	1,250	859	Cable	10	-----	851
	4-1146	4/ 2/18	1,250	859	Cable	10	-----	851
	4-1222	5/ 1/18	1,250	859	Cable	10	-----	856
	4-1329	6/ 7/18	1,225	898	Cable	8¼	-----	898

NUMBER FOUR; see page 110.

Shut-off			Result	
Cement				
Number sacks	Method	Formation shut-off	Success	Failure
97	----------	----------	8′ of water in 18 hours.	
100	Perkins	----------	1 gal. water in 21 hours.	
175	----------	----------	Hole bailed to 1,700′. Rise of 15′ in fluid in 21 hours.	
90	----------	----------	No water in 24 hours.	
7	Dump bailer	----------	10′ of water in 23 hours.	
5	Dump bailer	----------	5′ of water in 30½ hours.	
-----	----------	Landed on shell.	3′ of water in 21 hours.	
-----	----------	Landed in blue shale.	----------	43′ thin mud in 23 hrs.
-----	----------	Landed in shale.	Prospect shut off. 5′ of water in 13½ hours.	
-----	----------	Landed in shale.	Prospect shut off. 3′ of water in 21 hours.	
100	Tubing	----------	10′ water in 17 hours, due to drain back.	
100	Tubing	----------	10′ of oil and water in 19 hours.	
50	Tubing	----------	227′ oil; no water in 16½ hours.	
100	Tubing	----------	70′ oil, no water in 23 hours.	
120	Casing	----------	Hole bailed dry. 5′ rise in water.	
50	Casing	----------	20′ water in 16 hours.	
100	Dump bailer	----------	5′ water in 16½ hours.	
76	Casing	----------	20′ oil; no water in 19½ hours.	
120	Casing; Scott	----------	4 gals. water in 29 hours.	
100	----------	----------	30′ water in 30 hours.	
22	Dump bailer	----------	----------	At end of 60 days 27.2% water.
75	Tubing	----------	5′ water in 24 hours.	
40	Tubing	----------	----------	Company reported could not bail down.
50	Tubing	----------	10′ water in 16 hours.	
20	Dump bailer	----------	----------	Making considerable water.
50	Pumped through tubing.	----------	3′ water in 13 hours.	
40	Pumped through tubing.	----------	----------	Company reported no job.
70	Pumped through tubing.	----------	20′ tar sand, no water in 3 hours.	
80	Perkins	----------	Bailed to 1.200′. 4′ rise in 12½ hours.	
60	Baker	----------	No water in 23 hours.	
100	Scott	----------	2.0% water at end of 7 days.	
?	?	----------	No water at end of 66 days.	
24	Dump bailer	----------	Hole bailed to 1.809′. Fluid dropped 200′.	
75	----------	----------	----------	6 bbls. in 24 hours.
28	Pumped through casing.	----------	Hole bailed to 1,850′. No change in fluid level.	
-----	----------	4 jts. driven into 11½″ hole.	No water in 28 hours.	
125	Pumped	----------	Hole bailed to 2,250′. Rise of 10′ in 18 hours.	
40	Dump bailer		6′ of water in 21 hours.	
42	Dump bailer			Company reported no job.
42	Recemented dump bailer.			Company reported no job.
80	Dumped into casing	----------	----------	40′ water in 21 hours.
90	Perkins	----------	----------	120′ rise in 6½ hours.
100	Perkins	----------	4′ of water in 22 hours.	

TABLE IV. DISTRICT

Field, section, township, range, or lease	"T" report		Depth of hole		Water string			
						Casing		
	Number	Date	Total drilled (feet)	Bridged to (feet)	Tools	Diam. (inches)	Weight (pounds)	Length (feet)
Belridge—Continued.								
Sec. 2, T. 29 S., R. 21 E., M. D.	4-606	8/17/17	566	------------	Rotary	12½	45	564
	4-525	7/17/17	575	------------	Rotary	12½	-----	570
	4-519	7/11/17	558	------------	Rotary	12½	-----	551
	4-658	9/12/17	591	------------	Rotary	12½	-----	589
	4-605	8/17/17	570	------------	Rotary	12½	40	569
	4-1196	4/23/18	572	------------	Rotary	12½	40	569
	4-1266	5/21/18	588	------------	Cable	10	40	586
	4-1328	6/ 6/18	646	------------	Cable	8¼	-----	645
	4-1072	3/ 6/18	566	------------	Rotary	12½	40	564
	4-1169	4/13/18	608	------------	Cable	10	40	606
	4-1215	4/26/18	670	------------	Cable	8¼	-----	667
	4-1298	5/25/18	818	674	Cable	10	40	670
	4-704	10/ 1/17	575	------------	Rotary	12½	40	574
	4-721	10/ 9/17	657	------------	Rotary	10	-----	655
	4-803	11/23/17	581	------------	Rotary	12½	40	580
	4-761	10/29/17	583	------------	Rotary	12½	40	576
	4-722	10/ 9/17	589	------------	Rotary	12½	40	587
	4-777	11/ 5/17	603	------------	Rotary	12½	40	599
	4-889	12/30/17	607	------------	Rotary	12½	40	603
	4-865	12/15/17	607	------------	Rotary	12½	40	604
	4-843	12/ 7/17	590	------------	Rotary	12½	40	588
	4-1369	6/21/18	583	------------	Rotary	12½	40	580
	4-1294	5/24/18	587	------------	Rotary	12½	40	584
	4-1375	6/28/18	595	------------	Rotary	10	40	590
	4-1114	3/23/18	620	------------	Rotary	12½	40	615
	4-906	1/ 8/18	605	------------	Rotary	12½	40	603
	4-967	1/27/18	610	------------	Rotary	12½	40	607
	4-1006	2/ 9/18	655	------------	Cable	10	40	653
	4-1100	3/17/18	775	------------	Cable	10	40	761
	4-1131	3/29/18	649	------------	Rotary	12½	40	640
Sec. 3, T. 29 S., R. 21 E., M. D.	4-1249	5/10/18	599	------------	Rotary	12½	40	597
	4-1339	6/11/18	622	------------	Rotary	12½	40	618
	4-1058	3/ 3/18	545	------------	Cable	12½	40	540
	4-1177	4/17/18	584	------------	Cable	10	40	582
	4-1325	6/ 4/18	930	586	Cable	10	40	586
	4-944	1/18/18	626	------------	Rotary	12½	40	624
	4-991	2/ 4/18	638	------------	Rotary	12½	40	635
	4-577	8/ 3/17	548	------------	Rotary	12½	40	584
	4-577	8/ 3/17	990	577	Rotary	10	40	577
	4-799	11/23/17	629	------------	Rotary	12½	40	626
	4-1103	3/18/18	651	------------	Rotary	12½	40	647
	4-1258	5/20/18	982	793	Cable	10	40	793
	4-806	11/25/17	629	------------	Rotary	12½	40	624
	4-617	8/21/17	625	------------	Rotary	12½	40	622
	4-1153	4/ 6/18	1,022	643	Rotary	12½	40	633
	4-862	12/13/17	649	------------	Rotary	12½	40	645
	4-1022	2/20/18	790	------------	Cable	10	40	781
	4-770	10/31/17	643	------------	Rotary	12½	40	640
	4-797	11/23/17	780	------------	Cable	10	40	778
	4-877	12/21/17	736	697	Rotary	12½	40	697
	4-505	7/ 7/17	727	------------	Rotary	12½	40	725
Sec. 8, T. 29 S., R. 21 E., M. D.	4-717	10/ 6/17	3,170	------------	Cable	10	-----	3,150

NUMBER FOUR—Continued.

Shut-off			Result	
Cement				
Number sacks	Method	Formation shut-off	Success	Failure
160	Perkins		3′ of water in 16½ hours.	
160	Perkins		15′ of oil and water in 38 hours.	
160	Perkins		7′ of water in 13 hours.	
160	Perkins		10′ of water in 20½ hours.	
160	Perkins		1′ of water in 24 hours.	
160	Perkins			10′ of water in 2 hrs.
5	Dump bailer		Prospect shut off. 2′ of water in 17 hours.	
6	Driven 2′; dump bailer.		Prospect shut off. 1′ of water in 12 hours.	
160	Perkins			Tested with string of 10″ 2 joints screen pipe. 129′ of water in 15 hours.
12	Driven into small hole. Dump bailer.		1′ of water in 21 hours.	
6	Dump bailer		10′ of water in 19 hours.	
24	Perkins		1′ of water in 18½ hours.	
160	Perkins			Could not bail dry.
10	Dump bailer. Drain into 8″ hole.			
160	Perkins		1′ of water in 15 hours.	
160	Perkins		12′ oil and water in 20½ hours.	
160	Perkins		2′ of water in 15½ hours.	
160	Perkins		No water in 23 hours.	
160	Perkins		No water in 46 hours.	
160	Perkins		2′ of water in 21 hours.	
160	Perkins		No water in 18 hours.	
160	Perkins		4′ of water in 13 hours.	
160	Perkins			95′ of water in 7 hrs.
6	Dump bailer		6′ of water in 19 hours.	
160	Perkins		5 gals. water in 12 hours.	
160	Perkins		2′ of water in 27 hours.	
160	Perkins		1′ of water in 24½ hours.	
6	Dump bailer		Prospect shut off. 1′ of water in 14½ hours.	
40	Perkins		10 gals. of water in 16 hours.	
160	Perkins		2′ of water in 15 hours.	
160	Perkins		5′ of water in 12 hours.	
160	Perkins		2′ of water in 12 hours.	
70	Perkins		9′ of water in 25½ hours.	
12	Dump bailer		5′ of water in 18½ hours.	
12	Dump bailer			114′ of water in 18 hrs.
160	Perkins		No water in 18 hours.	
160	Perkins		1′ of water in 18 hours.	
160	Perkins			Company reported shut-off failure.
14	Dump bailer		Pumping test. 4 bbls. water per day.	
160	Perkins		No water in 16 hours.	
160	Perkins		No water in 13 hours.	
50	Perkins		2′ of water in 19 hours.	
160	Perkins		20 gals. water in 19 hours.	
160	Perkins		20′ of water in 16 hours.	
160	Perkins			18′ of water in 10 hrs.
160	Perkins		5′ of water in 15½ hours.	
20	Dump bailer			180′ water in 100 hrs.
160	Perkins		1′ of water in 18 hours.	
75	Dump bailer		No water in 22½ hours.	
160	Perkins		15′ drilling water in 30 hours.	
160	Perkins		2′ water in 22½ hours.	
160	Perkins		Hole bailed to 1,800′. 10′ rise in 18 hours.	

TABLE IV. DISTRICT

Field, section, township, range, or lease	"T" report		Depth of hole		Water string			
						Casing		
	Number	Date	Total drilled (feet)	Bridged to (feet)	Tools	Diam. (inches)	Weight (pounds)	Length (feet)
Belridge—Continued.								
Sec. 12, T. 29 S., R. 21 E., M. D.	4-1024	2/20/18	918	------------	Cable	10	40	916
	4-1024	2/20/18	904	------------	Rotary	12½	40	904
	4-1158	4/10/18	1,090	------------	Cable	10	40	1,087
	4-1259	5/20/18	1,114	------------	Cable	8¼	-----	1,110
Sec. 26, T. 29 S., R. 21 E., M. D.	4-636	8/28/17	1,713	1,363	Cable	8¼	-----	1,348
	4-1126	3/27/18	1,353	------------	Cable	8¼	-----	1,131
	4-1330	6/ 7/18	1,282	1,200	Cable	8¼	-----	1,187
	4-1089	3/13/18	932	------------	Cable	10	-----	928
	4-1264	5/20/18	1,271	------------	Cable	8¼	-----	1,267
	4-647	9/ 8/17	869	------------	Cable	8¼	38	859
McKittrick—								
Sec. 11, T. 30 S., R. 21 E., M. D.	4-624	8/23/17	620	------------	Cable	10	-----	620
	4-1257	5/20/18	646	------------	Cable	10	-----	639
	4-517	7/11/17	981	------------	Cable	10	-----	976
	4-772	10/31-17	820	------------	Cable	10	-----	808
	4-1101	3/18/18	855	------------	Cable	10	-----	842
	4-1297	5/25/18	800	------------	Cable	10	-----	779
	4-1120	3/27/18	1,082	540	Cable	11⅝	-----	537
	4-546	7/21/18	719	------------	Cable	11⅝	-----	713
	4-679	9/21/17	772	------------	Cable	11⅝	-----	767
	4-979	1/30/18	795	------------	Cable	11⅝	-----	790
Sec. 6, T. 30 S., R. 22 E., M. D.	4-520	7/14/17	2,958	------------	Cable	6¼	-----	2,940
	4-686	9/24/17	896	Pumping test.	Cable	10	-----	647
	4-635	8/27/17	662	------------	Cable	12½	-----	660
	4-1054	3/ 2/18	680	------------	Cable	10	-----	678
Sec. 8, T. 30 S., R. 22 E., M. D.	4-622	7/22/17	2,380	------------	Cable	10	-----	2,370
Sec. 16, T. 30 S., R. 22 E., M. D.	4-670	9/17/17	3,270	3,210	Rotary	8¼	-----	3,216
	4-839	12/ 5/17	3,045	3,032	Cable	6⅝	-----	3,032
Midway—								
Sec. 2, T. 31 S., R. 22 E., M. D.	4-1343	6/12/18	1,020	980	Cable	12½	40	980
	4-1119	3/26/18	995	976	Cable	12½	40	970
	4-1265	5/21/18	1,409	------------	Cable	10	40	1,403
Sec. 14, T. 31 S., R. 22 E., M. D.	4-1117	3/26/18	1,056	------------	Cable	12½	40	1,045
	4-1213	4/26/18	920	------------	Cable	12½	40	890
	4-1098	3/16/18	985	------------	Cable	12½	40	983
	4-1004	2/ 9/18	1,251	Pumping test.	Cable	12½	40	961
	4-1003	2/ 9/18	1,331	Pumping test.	Cable	12½	40	1,003
	4-1001	2/ 8/18	973	------------	Cable	12½	40	965
	4-882	12/21/17	972	------------	Cable	12½	40	968
	4-663	9/14/17	1,350	Pumping	Cable	12½	40	972
	4-743	10/20/17	1,015	------------	Cable	12½	40	1,006
	4-844	12/ 7/17	1,015	------------	Cable	12½	40	1,010
	4-1124	3/27/18	1,405	Pumping test.	Cable	12½	40	1,065
	4-1161	4/10/18	1,078	Pumping test.	Cable	12½	40	1,065
Sec. 15, T. 31 S., R. 22 E., M. D.	4-631	8/25/17	713	------------	Cable	10	-----	707
	4-532	7/ 9/17	828	------------	Cable	11⅝	40	824

NUMBER FOUR—Continued.

Shut-off			Result	
Cement				
Number sacks	Method	Formation shut-off	Success	Failure
7	Dump bailer		2' of water in 15 hours.	
160	Perkins			Company reported water not shut off.
15	Dump bailer		10' of water in 21 hours.	
5	Dump bailer			10' of sand in casing from behind 8¼.
130	Scott		4' of water in 17 hours.	
20	Scott			100 bbls. water per day.
35	Scott		20' oil; no water in 23 hours.	
20	Dump bailer			258' water in 18 hrs.
60	Perkins		2' water; 160' oil; in 19 hours.	
60	Huber & Wilson		1 bbl. water in 12 hours.	
100	Tubing		3' of water in 26 hours.	
80	Tubing		No water in 27 hours.	
-----		Landed in blue clay.	3' of mud in 73 hours.	
-----		Landed in blue clay.	1' of water in 48 hours.	
-----		Driven 5'; brown clay.	No water in 31 hours.	
-----		Landed in brown clay.	2' of mud in 31½ hours	
-----		Landed in blue clay.		90' of water in 22 hrs
100	Tubing		2' of water in 15½ hours	
100	Tubing		10 gals. water in 17 hours.	
200	Perkins		1' of water in 20 hours.	
60	Perkins		45' oil; no water in 23½ hours.	
25	Dump bailer		Trace of water at end of 130 days.	
-----		Landed in blue clay.	No water in 46 hours.	
50	Huber & Wilson		No water in 45 hours.	
160	Perkins		Hole bailed to 1,816'. No rise of fluid in 49½ hours.	
160	Perkins		Hole bailed to 2,053'. No rise in water in 48 hours.	
80	Perkins		Hole bailed to 2,510'. No rise in water in 24 hours.	
100	Perkins		2' of mud in 27 hours.	
100	Perkins		2' of oil; no water in 10 hours.	
50	Perkins		4' of water in 22 hours.	
25	Dump bailer		3' of water in 20½ hours.	
-----		Landed in brown shale.	10' of water in 27½ hours.	
75	Pumped into casing		4' water in 31 hours.	
28	Dump bailer		25 bbls. fluid; 8% emulsion at end of 30 days.	
25	Dump bailer		50 bbls. fluid; .8% water at end of 78 days.	
25	Dump bailer		110' of oil; no water in 18½ hours.	
30	Dump bailer		10' of oil; no water in 18½ hours.	
80	Scott		75 bbls. of fluid; no water at end of 18 days.	
-----		Landed in blue clay.	12' oil; no water in 22½ hours.	
-----		Driven into blue shale.	No water in 31 hours.	
-----		Landed in blue clay.	15 bbls. fluid; no water, at end of 23 days.	
-----		Landed in blue clay.	30 bbls. fluid; .2% water, at end of 76 days.	
50			2' of water in 23½ hours.	
80	Scott		5' of water in 44 hours.	

TABLE IV. DISTRICT

Field, section, township, range, or lease	"T" report		Depth of hole		Water string			
						Casing		
	Number	Date	Total drilled (feet)	Bridged to (feet)	Tools	Diam. (inches)	Weight (pounds)	Length (feet)
Midway—Continued.								
Sec. 21, T. 31 S., R. 22 E., M. D.	4-529	7/14/17	1,419	------------	Cable	10	-----	1,414
	4-737	10/15/17	1,780	1,730	Cable	8¼	-----	1,722
	4-1223	5/ 1/18	3,063	2,804	Cable	4½	-----	2,804
Sec. 26, T. 31 S., R. 22 E., M. D.	4-801	11/23/17	1,008	------------	Cable	12½	40	1,004
	4-930	1/16/18	1,658	------------	Cable	10	40	1,652
	4-732	10/15/17	1,730	------------	Cable	10	40	1,725
	4-902	1/ 3/18	1,059	------------	Cable	12½	40	1,051
	4-1005	2/ 9/18	1,700	------------	Cable	10	40	1,695
	4-1110	3/21/18	933	------------	Cable	12½	40	928
	4-1205	4/24/18	1,638	------------	Cable	10	40	1,630
	4-1272	5/21/18	1,018	------------	Cable	12½	40	1,015
	4-1346	6/14/18	1,500	------------	Cable	10	40	1,480
	4-795	11/23/17	1,057	------------	Rotary	8¾	28	1,047
	4-1157	4/ 6/18	1,136	------------	Rotary	8¼	28	1,176
	4-1221	5/ 1/18	1,125	------------	Rotary	8¼	28	1,107
	4-830	12/ 3/17	1,012	------------	Cable	10	40	1,010
	4-720	10/ 8/17	971	------------	Cable	10	40	968
	4-841	12/ 6/17	892	------------	Cable	12½	40	886
	4-919	1/11/18	1,516	------------	Cable	10	40	1,507
	4-1142	4/ 1/18	900	------------	Cable	12½	40	894
	4-1207	4/23/18	1,550	------------	Cable	10	40	1,546
	4-510	7/ 7/17	1,600	------------	Rotary	10	40	1,591
	4-567	7/30/17	1,538	------------	Rotary	8¼	-----	1,532
	4-829	12/ 1/17	1,235	------------	Cable	10	40	1,225
	4-691	9/25/17	1,181	------------	Cable	12½	-----	1,171
	4-643	9/ 6/17	1,186	------------	Cable	10	40	1,176
	4-916	1/11/18	1,215	------------	Cable	12½	-----	1,206
	4-634	9/14/17	1,454	------------	Cable	10	40	1,441
	4-895	12/31/17	1,523	------------	Rotary	10	40	1,523
	4-652	9/10/17	1,548	------------	Rotary	10	40	1,539
	4-964	1/27/18	1,800	Pumping test.	Rotary	10	40	1,450
	4-1123	3/27/18	1,500	Pumping test.	Cable	10	40	1,250
	4-748	10/23/17	1,225	------------	Cable	12½	-----	1,210
	4-1127	3/27/18	1,179	Pumping test.	Cable	12½	-----	1,057
Sec. 27, T. 31 S., R. 22 E., M. D.	4-1065	3/ 6/18	666	------------	Cable	12½	-----	659
	4-900	1/ 2/18	752	------------	Cable	12½	-----	741
	4-833	12/ 3/17	937	------------	Cable	12½	-----	925
	4-1017	2/19/18	780	------------	Cable	12½	-----	770
	4-1254	5/17/18	685	------------	Cable	12½	-----	675
	4-1318	6/ 1/18	647	601	Cable	12½	-----	598
Sec. 35, T. 31 S., R. 22 E., M. D.	4-778	11/ 5/17	980	------------	Cable	8¼	32	980
	4-846	12/ 7/17	990	980	Cable	8¼	32	980
	4-817	12/27/17	1,014	------------	Cable	10	-----	1,010
	4-610	8/21/17	1,190	1,180	Cable	10	-----	1,180
	4-547	7/21/17	1,222	------------	Cable	10	-----	1,214
	4-693	9/26/17	1,510	1,333	Cable	8¼	-----	1,333
	4-693	9/23/17	1,285	------------	Cable	10	-----	1,285
	4-731	10/15/17	1,295		Cable	10	-----	1,291
Sec. 19, T. 31 S., R. 23 E., M. D.	4-926	7/ 3/17	2,887		Rotary	8¼	36	2,879
	4-684	9/24/17	3,364	------------	Cable	8¼	36	3,358
	4-1165	4/11/18	4,233	------------	Cable	6¼	26	4,225

NUMBER FOUR—Continued.

Shut-off			Result	
Cement		Formation shut-off	Success	Failure
Number sacks	Method			
	Perkins	-----	-----	Could not bail water down.
60	Perkins	-----	-----	Rise of 36′ in 2 hours.
150	Perkins	-----	Bailed to 1,575′. No rise in fluid in 28 hours.	
24	Dump bailer	-----	1′ of water in 12 hours.	
27	Dump bailer	-----	2′ of water in 20 hours.	
25	Dump bailer	-----	10′ of water in 18⅔ hours.	
25	Dump bailer	-----	4′ of water in 24 hours.	
28	Dump bailer	-----	90′ of oil; no water in 23½ hours.	
39	Dump bailer	-----	No water in 35 hours.	
40	Dump bailer	-----	2′ of water in 19 hours.	
39	Dump bailer	-----	2′ of water in 13 hours.	
-----	-----	Casing froze	42′ of oil; 8′ of water in 19 hours.	
30	Dump bailer	-----	No water in 15 hours.	
40	Dump bailer	-----	5′ oil and water in 13 hours.	
40	Perkins	-----	90′ of oil; no water in 15 hours.	
-----	-----	Landed in blue clay.	3′ of water in 7 days.	
-----	-----	Landed in blue clay.	4′ of water in 49½ hours.	
25	Dump bailer	-----	3′ of water in 13 hours.	
-----	-----	Landed in blue clay.	Hole bailed to 1,220′. No rise in fluid in 48 hours.	
30	Dump bailer	-----	No water in 16 hours.	
22	Dump bailer	-----	7′ of water in 15 hours.	
100	Huber & Wilson	-----	8′ of oil; no water in 24½ hours.	
60	Huber & Wilson	-----	-----	317′ fluid in 43 hours.
40	Huber & Wilson	-----	40′ of oil; 5′ of water in 15½ hrs.	
100	Huber & Wilson	-----	126′ of oil; no water in 21½ hours.	
120	Huber & Wilson	-----	212′ of oil; no water in 45 hours.	
120	Huber & Wilson	-----	200′ of oil; 10′ emulsion in 21 hrs.	
120	Huber & Wilson	-----	160′ of oil; no water in 18 hours.	
160	Huber & Wilson	-----	800′ of oil; 10′ of water in 21½ hrs.	
120	Huber & Wilson	-----	800′ of oil; no water in 47 hours.	
160	Huber & Wilson	-----	-----	34% water.
120	Huber & Wilson	-----	-----	13 bbls. water per day.
120	Huber & Wilson	-----	85′ of oil; no water in 26½ hours.	
25	Huber & Wilson	-----	No water at end of 63 days.	
60	Huber & Wilson	-----	2′ of water in 18 hours.	
60	Huber & Wilson	-----	2′ of water in 20 hours.	
120	Huber & Wilson, through tubing.	-----	No water in 27½ hours.	
60	Huber & Wilson	-----	No water in 48 hours.	
60	Huber & Wilson	-----	No water in 18 hours.	
60	Huber & Wilson	-----	12′ of water in 14 hours.	
120	Huber & Wilson	-----	-----	Company reported water not shut off.
120	Huber & Wilson	-----	70′ of oil; no water; in 22 hours.	
160	Huber & Wilson	-----	330′ of oil; no water in 34 hours.	
100	Huber & Wilson	-----	2′ of water in 24 hours.	
100	Huber & Wilson	-----	2′ of oil; no water in 20 hours.	
30	Huber & Wilson	-----	200′ of oil in 24 hours.	
80	Huber & Wilson	-----	-----	Company reported water not shut off.
20	Dump bailer	-----	10′ of oily water in 33 hours.	
8	Scott	-----	No water in 18 hours.	
100	Casing	-----	-----	Could not bail water below 1,800′.
150	Dump bailer	-----	Hole bailed to 3,000′. No change in water level.	

TABLE IV. DISTRICT

Field, section, township, range, or lease	"T" report		Depth of hole		Water string			
						Casing		
	Number	Date	Total drilled (feet)	Bridged to (feet)	Tools	Diam. (inches)	Weight (pounds)	Length (feet)
Midway—Continued.								
Sec. 25, T. 31 S., R. 23 E., M. D.	4-579	8/ 6/17	2,066	------------	Rotary	8¼-7⅝	-----	2,056
	4-746	10/23/17	2,409	------------	Rotary	11	47	2,400
	4-708	10/ 4/17	2,515	------------	Rotary	8¼	-----	2,485
Sec. 27, T. 31 S., R. 23 E., M. D.	4-1084	3/10/18	1,926	------------	Rotary	10	-----	1,914
	4-1015	2/18/18	3,067	Pumping test.	Rotary	11	47	2,051
Sec. 31, T. 31 S., R. 23 E., M. D.	4-726	10/11/17	2,021	------------	Rotary	10	-----	2,010
	4-522	7-12/17	2,307	2,277	Cable	6¼	-----	2,277
	4-524	7/16/17	1,150	1,140	----------	10	-----	1,140
	4-507	7/ 7/17	2,280	------------	Cable	8¼	32	2,276
Sec. 32, T. 31 S., R. 23 E., M. D.	4-509	7/ 7/17	3,179	------------	Cable	8¼	-----	3,175
	4-623	8/23/17	3,190	------------	Cable	6¼	-----	3,185
	4-1335	6/11/18	3,497	------------	Cable	6⅝	-----	3,490
Sec. 35, T. 31 S., R. 23 E., M. D.	4-749	10/24/17	2,305	------------	Rotary	11	47	2,300
	4-1104	3/19/18	2,255	------------	Rotary	11	47	2,255
	4-798	11/23/17	2,210	------------	Rotary	11	47	2,200
	4-955	1-24-18	2,131	------------	Rotary	11	47	2,131
	4-927	1/16/18	2,138	------------	Rotary	11	47	2,130
	4-1306	5/27/18	2,139	------------	Rotary	10	-----	2,130
Sec. 36, T. 31 S., R. 23 E., M. D.	4-949	1/21/18	2,310	------------	Rotary	8¼	-----	2,300
	4-559	7/31/17	2,242	------------	Cable	8¼	-----	2,235
	4-847	12/ 7/17	2,265	------------	Cable	8¼	-----	2,250
	4-1031	2/21/18	2,225	------------	Cable	10	-----	2,221
	4-1283	5/23/18	2,607	2,325	Cable	10	-----	2,325
	4-1077	3/ 7/18	2,360	------------	Cable	8¼	-----	2,352
	4-592	8/11/17	2,512	------------	Rotary	10	-----	2,502
	4-687	9/24/17	2,365	------------	Rotary	8¼	-----	2,350
	4-764	10/31/17	2,472	------------	Rotary	8¼	-----	2,457
	4-754	10/25/17	2,304	------------	Rotary	12½	-----	2,297
	4-1273	5/21/18	2,495	------------	Rotary	10	-----	2,480
Sec. 31, T. 31 S., R. 24 E., M. D.	4-809	11/26/17	2,310	------------	Rotary	11	47	2,300

NUMBER FOUR—Continued.

Shut-off			Result	
Cement				
Number sacks	Method	Formation shut-off	Success	Failure
35	Perkins		Hole bailed to 1,600′. 5′ rise in fluid in 24 hours.	
		Landed in 30′ small hole.	Hole bailed to 1,400′. No change in 20 hours.	
70	Perkins		Hole bailed to 1,686′. 20′ rise in fluid in 17 hours.	
240	Perkins		Hole bailed to 1,703′. 5′ rise in fluid in 14 hours.	
		Landed in blue shale.	Well flowing—188 bbls. fluid. No water at end of 62 days.	
100	Scott		Hole bailed to 1,600′. No rise in water in 18 hours.	
60	Huber & Wilson		20′ of water in 18 hours.	
60	Huber & Wilson		4′ of oil; no water in 22 hours.	
60	Huber & Wilson		Hole bailed to 1,800′. 2′ rise in water in 18½ hours.	
20	Perkins			100′ rise in water in 12½ hours.
5	Dump bailer		Hole bailed to 2,655′. No rise in fluid in 28 hours.	
50	Perkins		Hole bailed to 2,190′. No rise in fluid in 22 hours.	
		Landed in hard shale.	Hole bailed to 1,500′. 20′ rise in 19 hours.	
		Landed in blue clay.	Hole bailed to 1,600′. 10′ rise in fluid in 12½ hours.	
		Landed in blue clay.	Hole bailed to 1,600′. 7′ rise in fluid in 18 hours.	
		Landed in blue shale.	Hole bailed to 1,536′. No rise in fluid in 17 hours.	
		Landed in blue shale.	Hole bailed to 1,600′. 15′ rise in fluid in 19 hours.	
		Driven in 30′ small hole.	Hole bailed to 1,600′. 3′ rise in fluid in 23 hours.	
80	Perkins		Hole bailed to 2,010′. 6′ rise in fluid in 29 hours.	
60	Perkins		Hole bailed to 1,800′. No rise in fluid in 18 hours.	
60	Perkins		Hole bailed to 2,200′. No rise in fluid in 16 hours.	
		Landed in brown shale.	1′ of water in 12½ hours.	
80	Perkins			200′ rise in water in 14 hours.
80	Perkins		Hole bailed to 2,100′. 17′ rise in fluid in 26 hours.	
240	Perkins		Hole bailed to 2,000′. 3′ of water in 10 hours.	
60	Perkins		Hole bailed to 1,997′. 35′ rise of oil in 16½ hours.	
80	Perkins		Hole bailed to 2,035′. 2′ rise in fluid in 24 hours.	
240	Perkins		Hole bailed to 1,300′. 5′ rise in fluid in 25 hours.	
240	Perkins		Hole bailed to 2,000′. 15′ rise in fluid in 25½ hours.	
100	Perkins		Hole bailed to 1,600′. 1′ of water in 15 hours.	

TABLE IV. DISTRICT

Field, section, township, range, or lease	"T" report		Depth of hole			Water string		
						Casing		
	Number	Date	Total drilled (feet)	Bridged to (feet)	Tools	Diam. (inches)	Weight (pounds)	Length (feet)
Midway—Continued.								
Sec. 1, T. 32 S., R. 23 E., M. D.	4-638	8/24/17	2,410	------------	Rotary	11	47	2,400
	4-625	8/24/17	2,207	------------	Rotary	11	47	2,200
	4-542	7/19/17	2,250	------------	Rotary	11	47	2,230
Sec. 2, T. 32 S., R. 23 E., M. D.	4-1025	2/20/18	2,637	------------	Rotary	8¼	-----	2,632
	4-1360	6-19/18	2,835	------------	Rotary	10	-----	2,820
Sec. 4, T. 32 S., R. 23 E., M. D.	4-1038	2/23/18	3,055	------------	Rotary	8¼	-----	3,035
	4-892	12/30/17	3,170	------------	Rotary	10	45	3,160
Sec. 5, T. 32 S., R. 23 E., M. D.	4-994	2/ 5/18	2,240	------------	Rotary	10	-----	2,232
	4-1016	2/19/18	2,104	------------	Rotary	10	-----	2,100
	4-1185	4/18/18	2,036	------------	Rotary	10	-----	2,031
	4-1233	5/ 5/18	1,856	------------	Rotary	10	-----	1,852
	4-1178	4-17-18	2,417	------------	Rotary	10	-----	2,363
	4-1310	5/28/18	2,590	------------	Rotary	8¼	-----	2,584
Sec. 6, T. 32 S., R. 23 E., M. D.	4-600	8/14/17	1,975	Pumping test.	----------	10	-----	1,954
	4-537	7/17/17	1,065	------------	Rotary	10	-----	1,010
Sec. 8, T. 32 S., R. 23 E., M. D.	4-899	1/ 2/18	589	------------	Cable	12½	40	584
	4-1206	5/25/18	800	750	Cable	10	40	750
	4-1141	3/31/18	1,200	1,179	Cable	6¼	-----	1.179
	4-1125	3/27/18	942	Pumping test.	Cable	12½	40	699
	4-1235	5/ 7/18	935	Pumping test.	Cable	12½	40	659
	4-1218	4/30/18	2,010	------------	----------	10	-----	2,000
	4-1250	5/14/18	1,512	------------	----------	12½	-----	1,497
	4-1115	3/23/18	698	------------	----------	12½	-----	693
	4-1384	6/27/18	732	------------	----------	8¼	-----	724
	4-1370	6/21/18	640	------------	----------	12½	-----	635
	4-1350	6/15/18	670	655	----------	12½	-----	655
Sec. 14, T. 32 S., R. 23 E., M. D.	4-1106	3/20/18	2,915	------------	Cable	6⅝	-----	2,900
	4-527	7/14/17	2,759	------------	Rotary	10	-----	2,750
	4-642	8/30/17	2,866	------------	Rotary	8¼	-----	2,860
	4-1045	2/27/18	2,417	------------	Rotary	10	-----	2,410
Sec. 15, T. 32 S., R. 23 E., M. D.	4-1170	4/13/18	1,111	------------	----------	10	-----	1,105
	4-917	1/11/18	869	------------	----------	12½	-----	863
	4-975	1/28/18	806	------------	----------	12½	-----	800
	4-1234	5/ 7/18	785	------------	----------	12½	-----	780
Sec. 23, T. 32 S., R. 23 E., M. D.	4-523	7/16/17	922	------------	Cable	12½	-----	919
	4-662	9/13/17	1,010	------------	Cable	12½	-----	1,001
Sec. 24, T. 32 S., R. 23 E., M. D.	4-582	8/ 7/17	2,319	------------	----------	10	-----	2,315
	4-827	12/ 1/17	2,442	------------	----------	8¼	-----	2,435
Sec. 5, T. 32 S., R. 24 E., M. D.	4-969	1/28/18	2,112	------------	Rotary	10	-----	2,092

NUMBER FOUR—Continued.

Shut-off			Result	
Cement		Formation shut-off	Success	Failure
Number sacks	Method			
-----	-----	Landed in blue clay.	Hole bailed to 1,500′. No rise in fluid in 15 hours.	
-----	-----	Landed in blue shale.	Hole bailed to 936′. 30′ rise in fluid in 22 hours.	
-----	-----	Landed in blue shale.	Hole bailed to 1,500′. 10′ rise in fluid in 21½ hours.	
?	Cemented	-----	Hole bailed to 2,000′. No rise in fluid in 17 hours.	
125	Scott	-----	Hole bailed to 1,650′. No rise in fluid in 18½ hours.	
240	Perkins	-----	Hole bailed to 2,200′. 4′ rise in fluid in 19¼ hours.	
240	Perkins	-----	Hole bailed to 2,200′. No rise in fluid in 13½ hours.	
120	Perkins	-----	Hole bailed to 1,600′. No rise in fluid in 19 hours.	
100	Perkins	-----	Hole bailed to 1,600′. 2′ rise in fluid level in 21½ hours.	
100	Perkins	-----	Hole bailed to 1,620′. No change in level in 20 hours.	
80	Perkins	-----	Hole bailed to 1,600′. 5′ rise in fluid in 23½ hours.	
120	Perkins	-----	Hole bailed to 1,600′. 7′ of water in 12 hours.	
60	Perkins	-----	Hole bailed to 1,600′. No rise in fluid in 24 hours.	
160	Huber & Wilson	-----	40 bbls. fluid; .6% water at end of 5 months.	
60	Huber & Wilson	-----	5 gals. water in 16½ hours.	
-----	-----	Landed in blue shale.	1′ of water in 15½ hours.	
15	Tubing	-----	15′ of oil; no water in 14 hours.	
40	Huber & Wilson	-----	3 gals. water in 20 hours.	
120	Huber & Wilson	-----	At end of 148 days, 125 bbls. of oil; no water.	
100	Huber & Wilson	-----	No water at end of 51 days.	
120	Huber & Wilson	-----	5′ of water in 21 hours.	
60	Huber & Wilson	-----	No water in 29 hours.	
60	Huber & Wilson	-----	-----	30′ of water in 19½ hrs.
60	Huber & Wilson	-----	No water in 20 hours.	
60	Huber & Wilson	-----	2′ of oil and water in 13 hours.	
60	Huber & Wilson	-----	1′ of oil in 29 hours.	
50	Perkins	-----	Hole bailed to 2,500′. 15′ rise in water in 21 hours.	
225	Perkins	-----	-----	400′ water in 40 hours
100	Casing	-----	Hole bailed to 2,300′. 15′ rise in water in 17 hours.	
300	Casing	-----	5′ of water in 17 hours.	
60	Huber & Wilson	-----	5′ of water in 18 hours.	
60	Huber & Wilson	-----	2′ of water in 8 days.	
60	Huber & Wilson	-----	No water in 15 hours.	
60	Huber & Wilson	-----	1 gal. of water in 17 hours.	
-----	-----	Landed in blue shale.	No water in 15½ hours.	
-----	-----	Landed in blue shale.	20 gals. water in 21 hours.	
200	Perkins	-----	Hole bailed to 1,735′. No rise in fluid in 26 hours.	
80	Perkins	-----	Hole bailed to 1,855′. 8′ rise in fluid in 21½ hours.	
100	Scott	-----	Hole bailed to 1,500′. No rise in fluid in 16 hours.	

TABLE IV. DISTRICT

Field, section, township, range, or lease	"T" report		Depth of hole		Water string			
						Casing		
	Number	Date	Total drilled (feet)	Bridged to (feet)	Tools	Diam. (inches)	Weight (pounds)	Length (feet)
Midway—Continued.								
Sec. 7, T. 32 S., R. 24 E., M. D.	4-694	9/26/17	2,160	------------	Rotary	11	-----	2,133
	4-1128	3/27/18	2,740	Pumping test.	Cable	8¼	-----	2,330
Sec. 9, T. 32 S., R. 24 E., M. D.	4-545	7/23/17	1,977	------------	Rotary	10	-----	1,970
	4-701	9/29/17	2,008	------------	Rotary	10	-----	1,988
	4-788	11/ 8/17	2,374	------------	Rotary	11	47	2,364
	4-911	1/ 9/18	2,320	------------	Rotary	11	-----	2,310
	4-786	11/ 6/17	2,312	------------	Rotary	11	-----	2,302
	4-880	12/21/17	2,235	------------	Rotary	11	-----	2,220
	4-1012	2/18/18	2,169	------------	Rotary	11	-----	2,136
	4-1012	2/18/18	2,195	------------	Rotary	8¼	-----	2,182
	4-1132	3/29/18	2,804	Pumping test.	Rotary	11	-----	2,137
Sec. 10, T. 32 S., R. 24 E., M. D.	4-1130	2/21/18	2,310	------------	Rotary	10	-----	2,296
	4-1118	3/26/18	2,214	------------	Rotary	10	-----	2,204
	4-1315	6/ 1/18	1,953	------------	Rotary	10	-----	1,943
Sec. 15, T. 32 S., R. 24 E., M. D.	4-1317	6/ 1/18	2,758	------------	Rotary	10	-----	2,750
	4-873	12/19/17	2,460	------------	Rotary	11	47	2,459
	4-1286	5/23/18	2,554	------------	Rotary	8¼	-----	2,550
Sec. 16, T. 32 S., R. 24 E., M. D.	4-775	11/ 3/17	2,920	------------	Cable	8¼	36	2,905
	4-1183	4/17/18	3,255	------------	Cable	8¼	36	3,250
	4-671	9/18/17	3,305	Production test.	Rotary	10	45	3,150
	4-515	7/11/17	3,226	------------	Rotary	10	45	3,212
	4-551	7/25/17	3,222	------------	Rotary	10	45	3,210
	4-856	12/12/17	3,270	------------	Rotary	8¼	36	3,254
	4-897	1/ 2/18	3,320	------------	Rotary	10	45	3,000
	4-1018	2/19/18	3,470	------------	Rotary	8¼	36	3,450
	4-367	9/17/17	3,425	Production test.	Rotary	10	45	2,931
	4-584	8/ 7/17	2,304	------------	Rotary	8¼	32	2,296
	4-637	8/28/17	3,110	------------	Rotary	10	----	3,100
	4-779	11/ 5/17	3,150	------------	Rotary	10	-----	3,110
	4-1130	3/29/18	3,166	------------	Rotary	8¼	----	3,165
	4-680	9/24/17	2,520	------------	Rotary	11⅝	----	2,500
	4-607	8/18/17	3,025	------------	Rotary	10	40-45	3,017
	4-1080	3/ 8/18	2,941	------------	Rotary	10	-----	2,931

NUMBER FOUR—Continued.

Shut-off			Result	
Cement				
Number sacks	Method	Formation shut-off	Success	Failure
		Landed in blue clay.	Hole bailed to 1,403′. 10′ rise in fluid in 24½ hours.	
100	Perkins		At end of 76 days, flowed 300 bbls. of oil; no water.	
		Landed in blue shale.	Hole bailed to 1,200′. 20′ rise in fluid in 26 hours.	
100	Scott		Hole bailed to 1,500′. 20′ rise in fluid in 16 hours.	
		Driven 30′ into formation.	Hole bailed to 1,200′. 6′ rise in fluid in 16 hours.	
		Landed in blue clay.	Hole bailed to 1,600′. No rise in fluid in 13 hours.	
		Driven into 30′ formation.	Hole bailed to 1,600′. 7′ rise in fluid in 23½ hours.	
		Landed in blue shale.	Hole bailed to 1,570′. Showed 7′ rise in 18 hours.	
		Casing froze		Company reported no job.
60	Perkins		Hole bailed to 1,610′. 4′ rise in fluid in 4 hours.	
		Landed in blue clay.	120 bbls. oil; no water; end of 13 days.	
200	Scott		Hole bailed to 1,505′. 3′ rise in fluid in 31 hours.	
90	Tubing		Hole bailed to 1,500′. Showed 5′ rise in 11½ hours.	
80	Tubing		Hole bailed to 1,630′. No rise in fluid in 31½ hours.	
		Landed in blue shale.	Hole bailed to 1,775′. No rise in fluid in 16½ hours.	
150	Perkins		Hole bailed to 1,715′. No rise in fluid in 15 hours.	
		Landed in blue clay.	Hole bailed to 1,800′. 7′ rise in fluid in 24½ hours.	
100	Perkins		15′ drop in fluid in 18½ hours.	
80	Perkins		4′ oil and water in 15½ hours.	
240	Perkins		Well flowed 34 bbls. fluid, .1% water.	
240	Perkins			Hole bailed to 2,000′. 185′ water in 10 hrs.
200	Perkins		Hole bailed to 224′. 16′ rise in fluid in 17 hours.	
80	Perkins		Hole bailed to 2,200′. 4′ rise in fluid in 17 hours.	
70	Perkins		Hole bailed to 2,200′. No rise in fluid in 12½ hours.	
70	Perkins		Hole bailed to 2,250′. 20′ rise in 16 hours.	
300	Scott		Well flowing at end of 6 months. 90 bbls. fluid, .1% water.	
650	Scott		Hole bailed to 1,600′. No change in fluid in 23 hours.	
600	Scott		Hole bailed to 2,346′. 5′ rise in fluid in 23½ hours.	
660	Scott		Hole bailed to 2,322′. No rise in water in 22½ hours.	
300	Scott		Hole bailed to 2,000′. 5′ fluid rise in 28 hours.	
100	Scott		Hole bailed to 1,692′. No rise in fluid in 16 hours.	
400	Scott		Hole bailed to 2,000′. 12′ rise in fluid in 24 hours.	
320	Scott		Hole bailed to 1,752′. 4′ rise in fluid in 23 hours.	

TABLE IV. DISTRICT

Field, section, township, range, or lease	"T" report		Depth of hole		Water string			
						Casing		
	Number	Date	Total drilled (feet)	Bridged to (feet)	Tools	Diam. (inches)	Weight (pounds)	Length (feet)
Midway—Continued.								
Sec. 17, T. 32 S., R. 24 E., M. D.	4-612	8/21/18	3,218	------------	Rotary	10	-----	3,200
	4-688	9/24/17	3,255	------------	Rotary	8¼	-----	3,250
	4-630	8/25/17	3,211	------------	Rotary	10	-----	3,201
	4-620	8/22/17	3,052	------------	Rotary	8¼	-----	3,047
	4-977	1/28/18	3,256	------------	Rotary	10	-----	3,250
	4-938	1/17/18	2,970	------------	Rotary	10	-----	2,947
	4-1217	4/30/18	2,868	------------	Rotary	10	-----	2,860
	4-903	1/ 3/18	2,712	------------	Rotary	10	-----	2,700
Sec. 18, T. 32 S., R. 24 E., M. D.	4-504	7/ 7/17	3,135	------------	Rotary	10	-----	3,125
	4-595	8/11/17	3,008	2,995	Cable	8¼	-----	2,995
	4-805	11/23/17	3,239	------------	Cable	6⅝	-----	3,225
Sec. 19, T. 32 S., R. 24 E., M. D.	4-812	11/25/17	2,305	------------	Rotary	10	-----	2,305
	4-812	11/25/17	2,371	------------	Rotary	8¼	-----	2,367
	4-1159	4/10/18	2,173	------------	Rotary	10	-----	2,170
	4-1262	5/20/18	2,158	------------	Cable	8¼	-----	2,154
	4-596	8/13/18	2,850	------------	Rotary	10	-----	2,850
	4-576	8/ 3/17	2,745	------------	Rotary	10	-----	2,725
	4-609	8/18/17	2,746	------------	----------	8¼	-----	2,743
Sec. 21, T. 32 S., R. 24 E., M. D.	4-1151	4/ 4/18	3,152	------------	Rotary	10	-----	3,150
	4-1174	4/16/18	3,261	------------	Rotary	10	-----	3,256
Sec. 28, T. 32 S., R. 24 E., M. D.	4-669	9/18/18	3,185	------------	Rotary	10	45	3,072
Sec. 30, T. 32 S., R. 24 E., M. D.	4-1043	2/25/18	2,020	------------	Cable	8¼	-----	1,960
	4-615	9/ 6/17	2,225	------------	Rotary	10	45	2,210
	4-942	1/18/18	2,225	------------	Rotary	10	45	2,214
	4-1046	2/27/18	2,250	------------	Rotary	8¼	-----	2,241
	4-736	10/15/17	2,315	------------	Rotary	8¼	-----	2,300
Sec. 31, T. 32 S., R. 24 E., M. D.	4-745	10/23/17	1,340	------------	Rotary	12½	-----	1,330
Sec. 33, T. 32 S., R. 24 E., M. D.	4-835	12/ 4/17	1,615	1,608	Rotary	10	-----	1,608
	4-1333	6/10/18	2,153	------------	Rotary	10	-----	2,150
	4-591	8/11/17	2,264	------------	----------	8¼	-----	2,261
Sec. 34, T. 32 S., R. 24 E., M. D.	4-729	10/11/17	2,990	------------	Cable	8¼	-----	2,987
	4-810	11/26/17	2,990	------------	Cable	8¼	-----	2,987
	4-1111	3/22/18	3,093	------------	Cable	6¼	-----	3,086
Sunset—								
Sec. 4, T. 11 N., R. 23 W., S. B.	4-569	8/ 1/17	2,501	------------	Rotary	10	40	2,501
	4-569	8/ 1/17	2,589	Production test.	Rotary	8¼	-----	2,574

NUMBER FOUR—Continued.

Shut-off			Result	
Cement				
Number sacks	Method	Formation shut-off	Success	Failure
110	Perkins			500′ water in 16½ hrs.
20	Perkins			4 bbls. water per day.
100	Perkins		Hole bailed to 1,600′. 10′ rise in fluid in 16½ hours.	
70	Perkins		Hole bailed to 1,600′. No rise in fluid in 26 hours.	
150	Perkins		Hole bailed to 1,700′. 10′ rise in fluid in 20 hours.	
150	Perkins			12′ rise in 6½ hours.
150	Perkins		Hole bailed to 1,720′. 6′ rise in fluid in 26½ hours.	
150	Perkins		Hole bailed to 1,700′. No rise in fluid in 17½ hours.	
240	Perkins		Hole bailed to 2,200′. No rise in fluid in 26½ hours.	
30	Dump bailer		Hole bailed to 2,200.′ 42′ rise in oil in 22 hours.	
30	Dump bailer		Hole bailed to 2,450′. No rise in fluid in 13 hours.	
100	Perkins			Company reported no job.
60	Perkins			500′ fluid in 18 hours.
150	Perkins		Hole bailed to 1,600′. 2′ rise in fluid in 18½ hours.	
30	Perkins		Hole bailed to 1,600′. 15′ rise in fluid in 19½ hours.	
100	Perkins		Hole bailed to 1,700′. 15′ rise in fluid in 22 hours.	
100	Perkins			90′ fluid in 11½ hours.
30	Perkins		Hole bailed to 1,715′. 5′ rise in fluid in 16 hours.	
150	Perkins		Hole bailed to 1,800′. 1′ rise in fluid in 18½ hours.	
150	Perkins		Hole bailed to 1,700′. 15′ rise in water in 29 hours.	
300	Perkins		At end of 9 months pumping 73 bbls. fluid; 1.4% water.	
-----	Perkins		At end of 92 days well pumped 35 bbls. fluid; .1% water.	
200	Perkins		Hole bailed to 1,800′. No rise in fluid in 8 hours.	
200	Perkins			975′ rise in 18½ hours
35	Dump bailer		Hole bailed to 2,000′. 70′ rise in oil in 15½ hours.	
200	Perkins		Hole bailed to 2,025′. No rise in fluid in 29½ hours.	
160	Perkins			Water broke in—no job.
70	Perkins		45′ oil; no water in 48 hours.	
130	Perkins		Hole bailed to 1,600′. 10′ rise in fluid in 24 hours.	
30	Perkins		Hole bailed to 1,800′. 10′ rise in fluid in 23 hours.	
80	Perkins			Flowed salt water
16	Re-cement; dump bailer.		Hole bailed to 1,240′. No change in fluid in 27½ hours.	
20	Perkins		Hole bailed to 1,650′. 10′ rise in fluid in 12 hours.	
-----	Perkins			Company reported no job.
50	Perkins			6% water, 11% emulsion.

TABLE IV. DISTRICT

Field, section, township, range, or lease	"T" report		Depth of hole		Water string			
						Casing		
	Number	Date	Total drilled (feet)	Bridged to (feet)	Tools	Diam. (inches)	Weight (pounds)	Length (feet)
Sunset—Continued.								
Sec. 4, T. 11 N., R. 23 W., S. B.	4-874	12/19/17	3,002	------------	Cable	6¼	-----	2,993
	4-568	8/1/17	2,615	------------	Rotary	10	40	2,604
	4-553	7/26/17	2,417	Production test.	Rotary	10	40	2,394
	4-676	9/20/17	2,411	------------	Rotary	10	40	2,408
	4-796	11/23/17	2,839	------------	Rotary	8¼	-----	2,832
	4-815	11/27/17	2,408	------------	Rotary	10	40	2,391
	4-1252	5/17/18	2,580	2,557	Rotary	8¼	-----	2,549
	4-1252	5/17/18	2,580	2,557	Rotary	8¼	-----	2,549
	4-1252	5/17/18	2,580	2,557	Rotary	8¼	-----	2,549
	4-1173	4/13/18	3,078	------------	Rotary	8¼	-----	3,073
	4-1655	3/3/18	2,603	------------	Rotary	10	40	2,598
	4-675	9/19/17	2,958	------------	Cable	6¼	-----	2,950
	4-575	8/3/17	3,015	------------	Cable	6¼	-----	3,005
	4-552	7/26/17	2,540	Production test.	Rotary	10	40	2,512
	4-1321	6/4/18	2,407	Production test.	Cable	8¼	-----	2,388
	4-1166	4/11/18	2,445	------------	Rotary	10	40	2,439
	4-802	11/23/17	3,195	------------	Rotary	8¼	-----	3,17[illegible]
	4-851	12/11/17	2,761	------------	Cable	8¼	-----	2,75[illegible]
	4-514	7/10/17	3,246	------------	Cable	8¼	-----	3,234
Sec. 5, T. 11 N., R. 23 W., S. B.	4-987	2/1/18	2,351	------------	Cable	8¼	-----	2,344
	4-508	8/13/17	2,313	------------	Rotary	11	47	2,301
	4-787	11/6/17	2,670	------------	Cable	8¼	36-28	2,666
	4-936	1/17/18	2,753	------------	Cable	6¼	-----	2,743
	4-1033	2/21/18	2,338	------------	Cable	8¼	-----	2,335
	4-528	7/16/17	2,965	------------	Cable	8¼	-----	2,960
	4-861	12/13/17	2,391	------------	Cable	8¼	-----	2,389
	4-773	10/30/17	2,254	Production test.	Rotary	11	47	2,223
	4-1175	4/16/18	2,244	------------	Rotary	10	40	2,237
	4-1300	5/25/18	2,246	------------	Rotary	10	40	2,244
	4-891	12/30/17	2,361	------------	Rotary	11	47	[illegible]
	4-861	12/30/17	2,461	------------	Cable	8¼	-----	2,458
Sec. 6, T. 11 N., R. 23 W., S. B.	4-965	9/28/17	2,238	------------	Cable	8¼	-----	2,234
	4-1071	3/6/18	2,402	------------	Cable	6¼	-----	2,400
Sec. 7, T. 11 N., R. 23 W., S. B.	4-1044	2/25/18	1,360	Production test.	Cable	10	40	1,328
	4-875	12/20/17	1,237	------------	Cable	10	40	1,232
	4-858	12/13/17	1,385	------------	Cable	12½	50	1,374
	4-931	1/16/18	1,432	------------	Cable	10	40	1,428
	4-1268	4/25/18	1,294	Production test.	Cable	12½	50	1,264
	4-1351	6/15/18	1,288	------------	Cable	12½	50	1,268

NUMBER FOUR—Continued.

Shut-off			Result	
Cement				
Number sacks	Method	Formation shut-off	Success	Failure
100	Perkins		Hole bailed to 200′. 3′ rise in fluid in 27 hours.	
140	Scott			100′ water in 24 hrs.
120	Perkins		200 bbls. fluid; 1.6% water.	
120	Perkins			180′ water in 16½ hrs.
110	Perkins		Hole bailed to 2,002′. No rise in fluid in 15 hours.	
160	Perkins			75′ water per hour.
45	Perkins			Company reported water broke in.
	Re-cement, 800# pressure.			Company reported no job.
	Re-cement, 800# pressure.			Company reported no job.
110	Perkins			Flowed 1,000 bbls. water per day.
120	Perkins			370′ water in 22 hours.
160	Perkins		Hole bailed to 2,020′. No rise in fluid in 12 hours.	
90	Perkins		Hole bailed to 2,013′. 2′ rise in fluid in 25 hours.	
120	Perkins		After 2 days well produced 133 bbls. oil; 4% water.	
12	Drove casing, dump bailer.		Small amount of water in hole.	
		Landed in blue shale.		Company reported water not shut off.
135	Scott		No water in 14 hours.	
		Landed in blue clay.	Hole bailed to 1,500′. No rise in fluid in 13½ hours.	
100	Scott		Hole bailed to 1,490′. 1′ rise in fluid in 19 hours.	
30	Perkins		Hole bailed to 1,620′. 2′ rise in fluid in 19 hours.	
160	Perkins			Water broke in.
80	Perkins		Hole bailed to 1,600′. 31′ rise in oil in 24 hours.	
30	Perkins		Hole bailed to 1,800′. 15′ rise in fluid in 18 hours.	
30	Perkins		Hole bailed to 1,600′. 4′ rise in fluid in 21 hours.	
120	Perkins		Hole bailed to 1,950′. No rise in fluid in 21 hours.	
80	Perkins		Hole bailed to 1,650′. 5′ rise in fluid in 18 hours.	
130	Scott		Well made 468 bbls. fluid, 1% water.	
50	Perkins			Cement did not set.
50	Perkins			800′ water in 19 hours.
130	Perkins			Water broke in.
60	Perkins		Hole bailed to 1,700′. 330′ oil; no water in 12½ hours.	
30	Scott		Hole bailed to 1,600′. 15′ rise in water in 21½ hours.	
11	Dump bailer			Water broke in.
20	Dump bailer		At end of 134 days made 125 bbls. per day; 1.2% water.	
100	Perkins		No water in 22½ hours.	
[illegible]	Perkins			225′ water in 13 hours
10	Dump bailer		600′ oil; no water in 22 hours.	
[illegible]	Perkins			8 bbls. water per day.
160	Perkins		234′ oil; no water in 13 hours.	

TABLE IV. DISTRICT

Field, section, township, range, or lease	"T" report		Depth of hole		Water string			
						Casing		
	Number	Date	Total drilled (feet)	Bridged to (feet)	Tools	Diam. (inches)	Weight (pounds)	Length (feet)
Sunset—Continued.								
Sec. 2, T. 11 N., R. 24 W., S. B.	4-573	7/28/17	418	------------	Cable	12½	50	414
	4-512	7/10/17	495	------------	Cable	12½	50	487
	4-541	7/19/17	513	------------	Cable	12½	50	500
	4-951	1/21/18	695	------------	Cable	12½	50	684
	4-1256	5/18/18	870	743	Cable	10	-----	730
Sec. 3, T. 11 N., R. 24 W., S. B.	4-581	8/ 7/17	297	------------	Cable	11⅝	-----	274
Sec. 12, T. 11 N., R. 24 W., S. B.	4-502	6/ 7/17	980	959	Cable	8¼	28	959
	4-1280	5/23/18	1,045	1,022	Cable	8¼	28	1,022
Sec. 30, T. 12 N., R. 23 W., S. B.	4-539	7/16/17	2,645	------------	Cable	8¼	-----	2,640
Sec. 31, T. 12 N., R. 23 W., S. B.	4-1078	3/ 7/18	1,920	------------	Rotary	12½	-----	1,918
	4-832	12/ 3/17	1,660	------------	Rotary	11	-----	1,654
	4-757	10/26/17	1,025	------------	Rotary	10	-----	1,025
	4-939	1/17/18	1,595	Production test.	Rotary	8¼	-----	1,400
	4-697	9/27/17	951	------------	Rotary	10	-----	948
	4-742	10/20/17	1,077	------------	Cable	8¼	-----	1,074
	4-587	8/ 8/17	1,555	------------	Rotary	12½	-----	1,550
	4-747	10/23/17	1,632	------------	Rotary	10	-----	1,625
	4-860	12/13/17	2,040	------------	Cable	6⅝	-----	2,036
	4-566	7/31/17	1,740	------------	Rotary	12½	-----	1,729
Sec. 32, T. 12 N., R. 23 W., S. B.	4-1059	3/ 3/18	2,532	------------	----------	10	-----	2,527
	4-914	1/11/18	2,930	------------	Cable	4½	-----	2,920
Sec. 26, T. 12 N., R. 24 W., S. B.	4-740	10/18/17	1,815	------------	Rotary	12½	-----	1,805
	4-888	12/28/17	1,690	------------	Rotary	12½	-----	1,684
Sec. 35, T. 12 N., R. 24 W., S. B.	4-1243	5/ 8/18	515	------------	Cable	10	-----	505
Sec. 36, T. 12 S., R. 24 W., S. B.	4-898	1/ 2/18	916	------------	Cable	10	-----	911
	4-665	9/14/17	1,055	Production test.	Rotary	12½	50	784
	4-1319	6/ 1/18	930	836	Rotary	12½	50	833
	4-649	9/10/17	1,634	------------	Rotary	10	-----	1,625
Sec. 36, T. 12 S., R. 24 W., S. B.	4-985	1/31/18	1,500	Production test.	Rotary	12½	50	1,350
	4-682	9/24/17	1.307	------------	Rotary	12½	50	1.300
	4-988	2- 1-18	935	------------	Rotary	12½	50	900
	4-988	2/ 1/18	935	------------	Rotary	12½	50	932
	4-821	11/27/17	1,315	1,295	Rotary	12½	50	1,295
	4-986	1/31/18	1,260	------------	Rotary	12½	50	1,250
	4-1037	2/23/18	1,258	------------	Rotary	12½	50	1,250
	4-1061	3/ 3/18	1.260	------------	Rotary	12½	50	1.250
	4-1230	5/ 3/18	1.260	------------	Rotary	10	-----	1,300

NUMBER FOUR—Continued.

Shut-off			Result	
Cement		Formation shut-off	Success	Failure
Number sacks	Method			
		Landed in shale.	10′ oil and water in 17 hours.	
120	Perkins		1′ water in 10½ hours.	
100	Perkins			2 bbls. water in 12 hrs.
100	Perkins		50′ oil; no water in 26 hours.	
50	Dump bailer		5′ of water in 25 hours.	
		Landed in blue clay.	3 bbls. water in 54 hours.	
		Driven 2′ into brown shale.	No water in 8 hours.	
		Landed in shale.	No water in 14 hours.	
20	Scott			Company reported water not shut off.
160	Perkins		Hole bailed to 1,600′. 4′ rise in fluid in 21 hours.	
130	Perkins		No water in 18 hours.	
	Perkins			Company reported no job.
150	Perkins		At end of 40 days well made 75 bbls. of oil; no water.	
90	Perkins			Company reported no job.
40	Perkins		Hole bailed to 1,000′. No change in fluid in 19 hours.	
100	Perkins		Hole bailed to 800′. No change in fluid in 8 hours.	
60	Perkins		Hole bailed to 1,005′. No change in fluid in 22½ hours.	
40	Perkins		Hole bailed to 1,600′. No change in fluid in 18 hours.	
103	Perkins		Hole bailed to 2,000′. No change in fluid in 13 hours.	
200	Scott		Hole bailed to 1,200′. No change in fluid in 24 hours.	
100	Scott		Hole bailed to 1,800′. 16′ rise in fluid in 14 hours.	
240	Perkins		Hole bailed to 1,250′. 25′ rise in oil in 18 hours.	
200	Perkins			Company reported water broke in.
		Landed in blue shale.	2′ water in 26 hours.	
80	Perkins		15′ oil; no water in 13½ hours.	
100	Perkins		At end of 92 days pumped 40 bbls. fluid per day; 8% water.	
125	Perkins		No water in 35 hours.	
25	Dump bailer		17′ rise in fluid in 14 hours.	
120	Perkins		End of 146 days made 32 bbls. fluid: 3.3% water.	
200	Perkins		5 gals. water in 10 hours.	
140	Perkins			Company reported no job.
30	Dump bailer		No water in 13½ hours.	
240	Perkins		No water in 30 hours.	
120	Perkins			Could not lower water.
20	Dump bailer			Could not lower water.
100	Pumped through tubing; 600# pres.			Could not lower water.
40	Dump bailer			Could not lower water.

TABLE IV. DISTRICT

Field, section, township, range, or lease	"T" report		Depth of hole		Water string			
						Casing		
	Number	Date	Total drilled (feet)	Bridged to (feet)	Tools	Diam. (inches)	Weight (pounds)	Length (feet)
Kern River—								
Sec. 27, T. 28 S., R. 27 E., M. D.	4-90	5/23/18	2,369	Production test.	Rotary	10	45	2,345
	4-97	6/12/18	2,379	------------	Cable	8¼	-----	2,378
Sec. 29, T. 28 S., R. 27 E., M. D.	4-13	9/12/17	3,073	------------	Cable	8¼	-----	3,073
	4-66	2/18/18	2,989	------------	Cable	8¼	-----	2,985
	4-88	5/ 8/18	3,046	------------	Cable	6¼	-----	3,043
Sec. 36, T. 28 S., R. 27 E., M. D.	4-8	8/16/17	1,094	------------	Cable	8¾	-----	1,087
	4-37	11/24/17	663	------------	Cable	12½	-----	658
Sec. 19, T. 28 S., R. 28 E., M. D.	4-60	1/31/18	985	Production test.	Cable	10	-----	769
Sec. 20, T. 28 S., R. 28 E., M. D.	4-86	5/ 8/18	884	710	Cable	9⅝	-----	704
	4-2	7/10/17	709	------------	Cable	11⅝	-----	706
	4-9	8/24/17	720	------------	Cable	9⅝	-----	715
	4-85	5/ 8/18	700	------------	Cable	11⅝	-----	690
	4-94	6/ 5/18	688	------------	Cable	11⅝	-----	686
Sec. 29, T. 28 S., R. 28 E., M. D.	4-5	7/21/17	474	------------	Cable	12½	-----	469
	4-26	11/ 5/17	471	------------	Cable	11⅝	----	467
Sec. 30, T. 28 S., R. 28 E., M. D.	4-65	2/18/18	1,020	Production test.	Cable	10	-----	808
	4-7	7/23/17	792	------------	Cable	10	-----	789
	4-4	7/21/17	547	------------	Cable	12½	-----	540
Sec. 31, T. 28 S., R. 28 E., M. D.	4-10	8/25/17	543	------------	Cable	10	-----	540
	4-1	7/ 5/17	633	------------	Cable	11⅝	-----	632
Sec. 3, T. 29 S., R. 28 E., M. D.	4-51	1/18/18	100	------------	Cable	11⅝	40	75
	4-75	3/29/18	104	------------	Cable	11⅝	40	100
	4-93	5/28/18	130	------------	Cable	11⅝	40	127
	4-92	5/28/18	117	------------	Cable	13½	-----	85
Sec. 4, T. 29 S., R. 28 E., M. D.	4-87	5/ 9/18	294	------------	Cable	9⅝	-----	290
Sec. 5, T. 29 S., R. 28 E., M. D.	4-102	6/27/18	552	------------	Cable	11⅝	40	550
	4-18	9/27/18	810	------------	Cable	9⅝	-----	771
Sec. 6, T. 29 S., R. 28 E., M. D.	4-82	4/27/18	857	------------	Cable	10	40	853
Sec. 9, T. 29 S., R. 28 E., M. D.	4-12	9/ 5/17	457	------------	Cable	11⅝	-----	454
	4-23	10/ 7/17	530	382	Cable	11⅝	-----	382
	4-25	10/16/17	399	------------	Cable	11⅝	----	394
Sec. 10, T. 29 S., R. 28 E., M. D.	4-36	11/21/17	210	------------	Cable	7⅝	----	208
	4-46	1/15/18	187	------------	Cable	7⅝	-----	181
	4-70	3/13/18	201	------------	Cable	8¼	-----	196
	4-83	5/ 1/18	171	------------	Cable	7⅝	-----	164

NUMBER FOUR—Continued.

Shut-off			Result	
Cement				
Number sacks	Method	Formation shut-off	Success	Failure
160	Perkins		30 bbls. fluid; 1.8% water.	
8	Dump bailer		Hole bailed to 2,055′. No change in fluid in 7 hours.	
60	Huber & Wilson			Could not bail down.
120	Perkins			Water broke in.
80	Perkins			Water broke in.
100	Perkins		No water in 24½ hours.	
		Driven into blue clay.	No water in 39½ hours.	
8	Dump bailer		10 bbls. oil; no water.	
30	Pumped through tubing.		10′ water in 21 hours.	
		Landed in clay.	No water in 18 hours.	
		Driven into clay.	No water in 26½ hours.	
		Landed in clay.	No water in 13½ hours.	
		Landed in clay.	1′ of water in 24 hours.	
		Landed in blue clay.	No water in 17½ hours.	
		Landed in blue clay.	No water in 23 hours.	
100	Perkins		3 bbls. oil; no water.	
100	Perkins		No water in 22½ hours.	
		Landed in blue clay.	No water in 16 hours.	
60			No water in 49½ hours.	
60			No water in 72 hours.	
		Landed in clay.	No water in 24 hours.	
		Landed in clay.	3′ water in 25 hours.	
		Landed in clay.	3′ water in 24 hours.	
		Landed in clay.	No water in 23½ hours.	
		Landed in clay.	No water in 20½ hours.	
		Landed in clay.	6′ water in 22½ hours.	
	Perkins		No water in 12 hours.	
100	Pumped through tubing.		4′ water in 17 hours.	
		Landed in clay.		Water broke in; 180′ in 5 minutes.
50	Pumped through tubing.			Water broke in.
		Driven 3′ in blue clay.	No water in 8 hours.	
		Driven into clay.	No water in 23½ hours.	
		Driven into clay.	No water in 26 hours.	
		Driven into clay.	No water in 24 hours.	
		Driven into clay.	No water in 24 hours.	

TABLE V. DISTRICT

Field, section, township, range, or lease	"T" report		Depth of hole		Water string			
						Casing		
	Number	Date	Total drilled (feet)	Bridged to (feet)	Tools	Diam. (inches)---	Weight (pounds)--	Length (feet)----
Coalinga—								
Sec. 2, T. 19 S., R. 15 E., M. D.	5-155	3/21/18	1,752	------------	Rotary	10	40	1,750
	5-172	5/ 4/18	2,078	------------	Rotary	10	40	2,073
	5-200	6/19/18	1,980	------------	Rotary	10	40	1,974
	5-66	10/12/17	2,200	------------	Rotary	8¼	-----	2,195
Sec. 10, T. 19 S., R. 15 E., M. D.	5-39	8/18/17	1,160	------------	Rotary	10	40	1,050
Sec. 11, T. 19 S., R. 15 E., M. D.	5-112	12/20/17	1,412	------------	Rotary	10	40	1,408
	5-127	1/16/18	1,407	------------	Rotary	10	40	1,403
	5-87	11/17/17	1,877	------------	Cable	8¼	36	1,875
	5-88	11/19/17	2,041	------------	Rotary	11	47	2,035
	5-61	10/ 4/17	2,231	------------	Rotary	10	40	2,226
	5-163	4/ 4/18	1,736	------------	Rotary	10	40	1,731
	5-183	5/11/18	1,770	------------	Rotary	8¼	36	1,768
	5-193	6/ 6/18	2,011	1,900	Cable	8¼	-----	1,900
Sec. 12, T. 19 S., R. 15 E., M. D.	5-142	2/26/18	3,035	------------	Rotary	10	40	3,029
	5-164	4/ 4/18	3,066	------------	Cable	8¼	36	3,064
	5-199	5/25/18	3,066	------------	Cable	8¼	36	3,065
Sec. 13, T. 19 S., R. 15 E., M. D.	5-156	3/22/18	3,071	3,043	Cable	8¼	36	3,043
Sec. 14, T. 19 S., R. 15 E., M. D.	5-31	8/ 8/17	2,038	------------	Rotary	10	45-48	2.036
	5-117	12/31/17	2,193	------------	Rotary	10	45	2,183 6′
	5-52	9/17/17	2,280	------------	Rotary	10	45-48	2,276
	5-62	10/ 6/17	2,287	------------	Rotary	10	48	2,284
	5-90	11/20/17	2,407	------------	Rotary	10	45-48	2,404
	5-108	12/15/17	2,424	------------	Cable	8¼	28-32	2,422
	5-96	12/ 6/17	2,398	------------	Rotary	10	45-48	2,396
	5-98	12/ 6/17	2,380	------------	Rotary	10	45-48	2.376
	5-103	12/12/17	2,181	------------	Rotary	10	45-48	2,176
	5-104	12/13/17	2,104	------------	Rotary	10	45-48	2,100
	5-109	12/15/17	1,968	------------	Rotary	10	45-48	1,965
	5-131	1/26/18	2,058	------------	Rotary	10	45-48	2,055
	5-203	6/25/18	1,928	------------	Rotary	10	45	1,925
	5-186	5/22/18	2,742	------------	Rotary	10	45	2.740
Sec. 22, T. 19 N., R. 15 E., M. D.	5-191	6/ 3/18	1,094	------------	Cable	10	-----	1,091
	5-95	11/30/17	1,047	------------	Cable	8¼	-----	1,042
	5-174	5/ 7/18	1,297	------------	Cable	8¼	-----	1,292
	5-73	10/26/17	1,175	------------	Cable	8¼	-----	1,170
	5-73	10/26/17	------	------------	Rotary	10	-----	1,150
	5-84	11/16/17	1,148	------------	Rotary	10	47	1,143
	5-116	12/27/17	1,020	------------	Rotary	10	-----	1.014
	5-129	1/19/18	1,063	------------	Cable	8¼	-----	1,058
	5-102	12/11/17	1,449	------------	Cable	8¼	28	1,449
	5-118	12/31/17	1,297	------------	Rotary	10	-----	1,294
	5-151	3/15/18	1,333	------------	Rotary	10	-----	1,326
	5-178	5/11/18	1,385	------------	Cable	8¼	-----	1,378
Sec. 26, T. 19 S., R. 15 E., M. D.	5-114	12/21/17	2,010	------------	Cable	8¼	-----	1.990
	5-21	7/20/17	2.375	------------	Rotary	10	45-48	2,371
	5-26	7/30/17	2,354	------------	Rotary	10	45-48	2,351
	5-139	2/16/18	3,102	------------	Rotary	10	45-48	3 100
	5-137	2/ 7/18	2,009	------------	Rotary	10	45-48	2,007
	5-165	4/ 5/18	2,113	------------	Rotary	10	45-48	2,110
Sec. 27, T. 19 S., R. 15 E., M. D.	5-29	7/ 6/17	1,453	------------	Cable	10	45	1.450
	5-18	7/17/17	1,642	------------	Cable	10	-----	1,640
	5-18	7/17/17	------	------------	Rotary	12½	-----	1,233
	5-24	7/28/17	1,206	------------	Rotary	12½	40	1,203

NUMBER FIVE; see page 110.

Shut-off			Result	
Cement				
Number sacks	Method	Formation shut-off	Success	Failure
300	Perkins		40′ of water in 17 hours.	
300	Perkins		Hole bailed to 1,750′; 1′ of water in 23 hours.	
300	Perkins		Hole bailed to 1,700′; 36′ of fluid, 50% water, 19 hours.	
10	Dump bailer		21′ of water in 41 hours.	
			Lead line test showed 8% water.	
160	Perkins		3 gals. water in 29 hours.	
160	Perkins		1 gal. water in 16 hours.	
16	Dump bailer		3 gals. water in 16 hours.	
200	Perkins			75′ water in 17 hours.
200	Perkins		⅓ bailer water in 14 hours.	
70	Perkins			101′ water in 23 hrs.
72	Dump bailer		12′ water in 24 hours.	
30	Dump bailer		25′ water in 27 hours.	
150	Perkins			Could not bail down.
15	Dump bailer			12 gals. water per hr.
24	Recemented dump bailer.		Hole bailed to 2,000′; 115′ sulphur water came in.	
60	Perkins		Pumping test, 200 bbls. fluid; 5% water.	
200	Perkins		22′ oil, no water, 12 hours.	
130	Pumped through tubing.		2′ water in 19 hours.	
200	Perkins		Fluid rise to 1,430′; no water on bottom.	
200	Perkins		5′ water in 12 hours.	
201	Perkins		3 gals. water in 17 hours.	
30	Dump bailer		2′ water in 20 hours.	
201	Perkins		No free water at test.	
200	Perkins		3 gals. water in 13 hours.	
200	Perkins		Sand and oil, no water, 18 hours.	
200	Perkins		8 gals. water in 13 hours.	
200	Perkins		20′ fluid, 10% water, 16 hours.	
200	Perkins		10 gals. water in 14 hours.	
200	Perkins		25′ of water in 16 hours.	
200	Perkins		22′ of water in 22½ hours.	
22	Dump bailer		1 gal. water in 42 hours.	
39	Dump bailer		1′ dry sand, 22 hours.	
40	Dump bailer		6′ water in 19 hours.	
40	Dump bailer		85′ oil, no water, in 12 hours.	
				Company reported water not shut off.
140	Perkins		1′ water in 19 hours.	
140	Perkins			60′ water in 12 hours.
35	Dump bailer		½ gal. water in 13 hours.	
30	Perkins		30′ of oil, no water. 17 hours.	
60	Perkins		3 gals. mud in 17 hours.	
60	Perkins		90′ of oil, no water, 24 hours.	
60	Perkins		150′ of oil, no water, in 24 hrs.	
105	Pumped through tubing.			⅓ bailer water per hr.
197	Perkins		12 gals. water in 19 hours.	
200	Perkins		4′ of water in 18 hours.	
260	Perkins		Hole bailed to 2,300′; rise of 12′ in 30 hours.	
260	Perkins		2 gals. water in 12 hours.	
200	Perkins		1 gal. mud in 13½ hours.	
60	Perkins		16 gals. water in 34 hours.	
58	Perkins		4′ of water in 14 hours.	
				Company reported water not shut off.
198	Perkins		Hole bailed to 1,000′; 5′ rise in fluid in 28 hours.	

TABLE V. DISTRICT

Field, section, township, range, or lease	"T" report		Depth of hole		Water string			
						Casing		
	Number	Date	Total drilled (feet)	Bridged to (feet)	Tools	Diam. (inches)	Weight (pounds)	Length (feet)
Coalinga—Continued—								
Sec. 27, T. 19 S., R. 15 E., M. D.	5-48	9/10/17	1,488	------------	Cable	10	45	1,485
	5-45	9/ 5/17	2,013	------------	Rotary	10	45	2,011
	5-44	8/31/17	1,934	------------	Rotary	10	45	1,930
	5-65	10/12/17	1,855	------------	Rotary	10	45	1.851
	5-64	10/10/17	1,941	------------	Rotary	10	45	1,938
	5-78	11/ 5/17	1,636	------------	Rotary	10	45	1,633
	5-86	11/17/17	1,650	------------	Cable	8¼	32-36	1,648
	5-119	1/ 2/18	1,842	------------	Rotary	10	45-48	1,840
	5-143	2/27/18	1,948	------------	Rotary	10	48	1,945
	5-150	3/15/18	1,535	------------	Rotary	10	45	1,533
	5-189	5/28/18	1,523	------------	Rotary	10	45	1,520
	5-158	3/26/18	1,568	------------	Rotary	10	45	1.565
	5-176	5/ 6/18	1,542	------------	Rotary	10	40-45	1,540
	5-167	4/11/18	1,553	------------	Rotary	10	40-45	1,550
	5-196	6/12/18	1,507	------------	Rotary	10	40-48	1,505
	5/195	6/13/18	1,315	------------	Rotary	10	45	1,313
Sec. 28, T. 19 S., R. 15 E., M. D.	5-16	7/14/17	714	------------	Cable	12½	-----	711
	5-57	9/27/17	1,374	------------	Cable	10	40-45	1,369
	5-101	12/10/17	2,755	------------	Cable	8¼	-----	2,750
Sec. 29, T. 19 S., R. 15 E., M. D.	5-68	10/15/17	2,699	------------	Rotary	10	48	2,696
	5-105	12/13/17	2,699	2,672	Rotary	10	48	2,655-2,665
	5-134	2/ 2/18	2,743	------------	Cable	8¼	-----	2,733
Sec. 31, T. 19 S., R. 15 E., M. D.	5-147	3/ 5/18	1,265	------------	Cable	10	-----	1,261
Sec. 32, T. 19 S., R. 15 E., M. D.	5-197	6/16/18	2,020	------------	Rotary	10	40	2,014
	5-76	11/ 1/17	1,990	------------	Rotary	10	40	1,985
	5-111	12/19/17	2,073	------------	Rotary	10	40	2,067
	5-125	1/10/18	2,168	------------	Rotary	10	40	2,161
	5-148	3/ 6/18	2,265	------------	Rotary	10	40	2,259
	5-181	5/13/18	2,370	------------	Rotary	10	40	2,364
	5-46	9/ 8/17	1,946	------------	Rotary	10	40-45	1,940
	5-133	2/ 1/18	1,911	------------	Rotary	10	-----	1,894
	5-82	11/12/17	2,020	------------	Rotary	10	47	2,012
	5-106	12/14/17	2,210	------------	Rotary	10	45	2,201
	5-67	10/12/17	2,125	------------	Rotary	10	40-45	2,112
	5-27	8/ 1/17	2,093	------------	Rotary	10	40-45	2,088
	5-123	1/ 9/18	2,323	------------	Rotary	8¼	-----	2,316
	5-198	6/15/18	2,254	------------	Rotary	10	40-45	2,254
	5-185	5/22/18	2,221	------------	Rotary	8¼	-----	2,216
	5-92	11/23/17	2,428	------------	Rotary	10	-----	2,428
	5-92	11/23/17	2,456	------------	Cable	8¼	-----	2,453
	5-213	1/ 9/18	2,323	------------	Rotary	10	-----	2,226

NUMBER FIVE—Continued.

Shut-off			Result	
Cement				
Number sacks	Method	Formation shut-off	Success	Failure
60	Perkins		5′ water in 28 hours.	
200	Perkins		Hole bailed to 1,500′; 40′ rise in fluid, oil, 16 hours.	
198	Perkins		5′ water in 15 hours.	
200	Perkins		5′ oil and water in 20 hours.	
200	Perkins		1 gal. water in 12 hours.	
200	Perkins		Hole bailed to 1,177′; water came in from below shoe.	
20	Dump bailer		1 qt. oil in 17 hours.	
200	Perkins		2 gals. water in 28 hours.	
200	Perkins		No water came into hole in 15 hours.	
200	Perkins		1 gal. water in 19 hours.	
200	Perkins		7′ oil and water in 12 hours.	
200	Perkins		4 gals. water in 22½ hours.	
200	Perkins		5 gals. water in 13 hours.	
200	Perkins		2′ of water in 15 hours.	
200	Perkins		10′ of water in 12 hours.	
200	Perkins		5′ of water in 19 hours.	
30	Dump bailer		Hole stood dry 18 hours.	
32	Dump bailer		Hole bailed to 50′; no change in 19 hours.	
40	Dump bailer		Hole bailed to 2,408′; 25′ of water in 24 hours.	
200	Perkins			760′ water in 21 hrs.
25	Pumped through rips.			320′ water in 15 hrs.
31	Tubing, 1,000 lbs. pressure.		No water after 12 hours.	
80	Perkins		10′ of water in 12 hours.	
150	Pumped through tubing.		2 qts. of water in 19 hours.	
150	Perkins		4′ mud and water in 15½ hours.	
150	Pumped through tubing.		8 gals. water in 15 hours.	
150	Pumped through tubing.		½ gal. mud in 12 hours.	
150	Pumped through tubing.		5 gals. mud in 12½ hours.	
150	Pumped through tubing.		3 gals. water in 15½ hours.	
150	Perkins		Hole bailed to 1,800′; 27′ of water in 12 hours.	
150	Perkins		12′ sulphur water in 18 hours.	
150	Perkins		Hole bailed to 1,800′; 12′ of water in 14 hours.	
150	Perkins		22′ of water in 12 hours.	
150	Perkins		15′ of water in 13 hours.	
150	Perkins		Hole bailed to 1,800′; 12′ of water in 19½ hours.	
144	Perkins		Hole bailed to 2,000′; 20′ water in 20 hours.	
150	Perkins		Hole bailed to 2,075′; no change in 13 hours.	
80	Perkins		Hole bailed to 2,000′; 10′ of water in 20 hours.	
150	Perkins			Company reported shut-off failure.
25	Pumped through tubing.		2′ of water in 15 hours.	
150	Perkins			Company reported shut off failure.

TABLE V. DISTRICT

Field, section, township, range, or lease	"T" report		Depth of hole		Water string			
						Casing		
	Number	Date	Total drilled (feet)	Bridged to (feet)	Tools	Diam. (inches)	Weight (pounds)	Length (feet)
Coalinga—Continued.								
Sec. 34, T. 19 S., R. 15 E., M.D.	5-59	9/29/17	1,842	------------	Rotary	10	45	1,840
	5-54	9/21/17	1,746	------------	Rotary	10	45-48	1,745
	5-153	3/18/18	1,868	------------	Rotary	10	45	1,865
	5-166	4/ 8/18	1,798	------------	Rotary	10	45	1,796
	5-187	5/22/18	1,802	------------	Rotary	10	45	1,800
	5-171	4/30/18	2,467	------------	Rotary	10	45-48	2,465
Sec. 35, T. 19 S., R. 15 E., M. D.	5-38	8/18/17	3,407	------------	Cable	8¼	-----	3,402
	5-160	3/29/18	3,423	------------	Cable	8¼	-----	3,417
	5-157	3/22/18	3,273	Pumping test.	Cable	8¼	-----	3,131
	5-37	8/17/17	2,537	------------	Rotary	11	47	2,532
	5-32	8/13/17	2,356	------------	Rotary	11	47	2,345
	5-188	3/27/18	2,398	------------	Cable	8¼	-----	2,390
	5-74	10/31/17	2,271	------------	Rotary	11	60	2,262
	5-53	9/18/17	2,480	------------	Rotary	11	47	2,474
	5-161	3/29/18	2,595	------------	Cable	8¼	-----	2,590
	5-161	3/29/18	2,595	------------	Rotary	11	-----	2,550
	5-70	10/22/17	2,557	------------	Rotary	10	45	2,550
	5-71	10/29/17	2,463	------------	Rotary	10	45	2,451
	5-135	2/ 4/18	2,455	------------	Rotary	11	47	2,448
	5-170	4/18/18	2,529	------------	Rotary	10	-----	2,524
	5-175	5/ 7/18	2,536	------------	Cable	8¼ liner	36	2,535
	5-194	6/ 7/18	2,548	------------	Rotary	11	47	2,539
	5-204	6/25/18	2,556	------------	Cable	8¼ liner	36	2,552
	5-173	6/ 3/18	2,624	------------	Rotary	11	-----	2,619
	5-173	6/ 3/18	2,624	------------	Rotary	10	-----	2,619
Sec. 1, T. 20 S., R. 14 E., M. D.	5-56	9/24/17	309	------------	Cable	8¼	36	302
	5-93	10/26/17	320	------------	Cable	8¼	28	310
Sec. 12, T. 20 S., R. 14 E., M. D.	5-42	8/27/17	1,084	------------	Cable	10	40	1,081
	5-128	1/15/18	462	------------	Cable	10	40	451
	5-192	6/ 3/18	846	------------	Cable	10	40	841
	5-59	9/11/17	732	------------	Cable	10	35-40	726
Sec. 14, T. 20 S., R. 14 E., M. D.	5-85	11/16/17	-------	511	Cable	8¼-7⅝	-----	510
Sec. 24, T. 20 S., R. 14 E., M. D.	5-60	10/ 4/17	1,080	------------	Rotary	10	35	1,070
	5-91	11/22/17	1,150	1,126	Cable	6⅝	-----	1,126
Sec. 1, T. 20 S., R. 15 E., M. D.	5-40	8/21/17	3,667	------------	Cable	8¼	43	3,662
	5-14	7/11/17	4,092	Pumping test.	Cable	8¼	43	3,848
	5-41	8/25/17	3,960	3,945	Cable	6¼	264	3,945
	5-23	7/27/17	3,747	3,734	Cable	8¼	43	3,734
	5-140	2/19/18	3,710	------------	Cable	8¼	43	3,708
Sec. 2, T. 20 S., R. 15 E., M. D.	5-169	4/15/18	3,682	------------	Cable	8¼	36	3,680
	5-20	7/18/17	3,534	------------	Cable	8¼	36	3,534
	5-168	4/11/18	3,402	------------	Cable	8¼	36	3,400
	5-201	6/18/18	3,363	------------	Cable	8¼	36	3,361
Sec. 6, T. 20 S., R. 15 E., M. D.	5-79	11/ 6/17	969	------------	Cable	10	40	967

NUMBER FIVE—Continued.

Shut-off			Result	
Cement				
Number sacks	Method	Formation shut-off	Success	Failure
200	Perkins		2 gals. water in 15 hours.	
200	Perkins		110′ of fluid, no water, 19 hrs.	
200	Perkins		100′ oil, no water, 30 hours.	
200	Perkins		1′ water in 27 hours.	
200	Perkins		5′ water in 14 hours.	
200	Perkins		3′ of water in 13 hours.	
200	Perkins		Pumping test; trace of water at lead line.	
200	Perkins		1′ of water in 17 hours.	
200	Perkins		4.4% water.	
200	Perkins		20′ of water in 20 hours.	
200	Perkins		20′ of water in 13 hours.	
30	Dump bailer		35′ of water in bailer in 18 hrs.	
200	Perkins		35′ of water in hole in 22 hours.	
200	Perkins		25′ of water in 21 hours.	
50	Perkins		2′ of water in 24 hours.	
200	Perkins			Company stated could not bail below 2,200′.
200	Perkins		No free water in 21½ hours.	
200	Perkins		⅔ bailer of water in 19 hours.	
200	Perkins		1 gal. water in 27½ hours.	
160	Perkins			Water came in at rate of 130′ per hr.
20	Dump bailer		Top of liner at 2,495′; no water in 13 hours.	
160	Perkins			Water came in 230′ in 12 hours.
22	Dump bailer		5′ of water in 14 hours.	
-----	Perkins			Company reported shut-off failure.
160	Perkins			360′ water in 20 hrs.
----		Landed in shale.	Hole stood dry 12 hours.	
----		Landed in blue clay.	½ gal. water in 17 hours.	
100	Perkins		Hole bailed to 810′; 2′ rise in 19½ hours.	
20	Dump bailer		1 qt. mud in 12 hours.	
100	Perkins		No free water in 15½ hours.	
-----			No water in 17 hours.	
-----		Landed in clay.	5′ of water in 25 hours.	
160	Casing		10′ of oil and water in 20 hrs.	
107	Tubing		Fluid came through bridge; 40′ in 24 hours.	
190	Perkins		10′ water in 24 hours.	
200	Perkins		Lead line sample showed a trace of water.	
60	Pumped through tubing.		Hole bailed to 3,441′; 78′ drilling water returned.	
200	Perkins		Few gals. water in 17 hours.	
200	Perkins		Hole bailed to 2,590′; 18′ of fluid, 20% water, 21 hours.	
125	Tubing		12′ of water in 13½ hours.	
125	Tubing		10′ of water in 14 hours.	
125	Tubing		Hole bailed to 3,000′; 15′ of fluid in 13 hours.	
125	Tubing		Hole bailed to 2,510′; no water in 14½ hours.	
20	Dump bailer		1′ of water in 13½ hours.	

TABLE V. DISTRICT

Field, section, township, range, or lease	"T" report		Depth of hole		Water string			
						Casing		
	Number	Date	Total drilled (feet)	Bridged to (feet)	Tools	Diam. (inches)	Weight (pounds)	Length (feet)
Coalinga—Continued.								
Sec. 7, T. 20 S., R. 15 E., M. D.	5-9	7/10/17	2,058	------------	Cable	8¼	32	2,050
	5-28	8/ 3/17	1,928	------------	Cable	8¼	-----	1,288
Sec. 8, T. 20 S., R. 15 E., M. D.	5-162	3/30/18	2,788	------------	Rotary	10	-----	2,777
	5-177	5/ 7/18	2,803	------------	Cable	8¼	-----	2,797
Sec. 12, T. 20 S., R. 15 E., M. D.	5-55	9/21/17	4,628	------------	Cable	6¼	28	4,613
	5-47	9/ 8/17	4,226	------------	Cable	6¼	28	4,214
	5-132	1/28/18	4,228	------------	Cable	6¼	26	4,215
	5-110	12/17/17	3,930	------------	Cable	8¼	36	3,919
Sec. 18, T. 20 S., R. 15 E., M. D.	5-205	6/29/18	2,535	------------	Cable	6⅝	26	2,331
	5-180	5/13/18	2,292	------------	Cable	6¼	-----	2,290
Sec. 20, T. 20 S., R. 15 E., M. D.	5-141	----------	3,340	------------	Cable	6¼	-----	3,326

NUMBER FIVE—Continued.

Shut-off			Result	
Cement				
Number sacks	Method	Formation shut-off	Success	Failure
50			48′ of drilling water in 12 hrs.	
58	Tubing		15′ of mud and oil in 16½ hours.	
300	Perkins			207′ water in 17 hrs.
30	Tubing		14′ of water in 17½ hours.	
120	Perkins			1,266′ water in 16½ hrs.
70	Perkins		Hole bailed to 3,200′; 20′ of water in 19 hours.	
70	Perkins		Hole bailed to 3,198′; 9 gals. water in 13½ hours.	
60	Perkins		1 gal. water in 13 hours.	
150	Tubing		5 gals. water in 22½ hours.	
12	Dump bailer		15′ of water in 24½ hours.	
40	Perkins		6′ of water per hour.	

PROGRESS CHART FOR COMPARISON OF A GROUP OF DRILLING WELLS.

By R. E. COLLOM, Chief Deputy.

During drilling operations at certain wells of a group it frequently happens that there are marked changes in producing conditions at neighboring wells. In order to compare the effect of drilling wells upon the other wells a chart showing drilling progress will be found more convenient than written records. The chart here presented differs from those ordinarily used in engineering work in that it directly refers to distances from known strata rather than the ground surface. It therefore directly compares geological information with drilling and production data.

Referring to the accompanying cross-section of a group of wells, (fig. 8) it will be noted that a line of correlation, "B," has been drawn across the top of the oil sands of the "second oil zone." This line defines the stratigraphy of the formations.

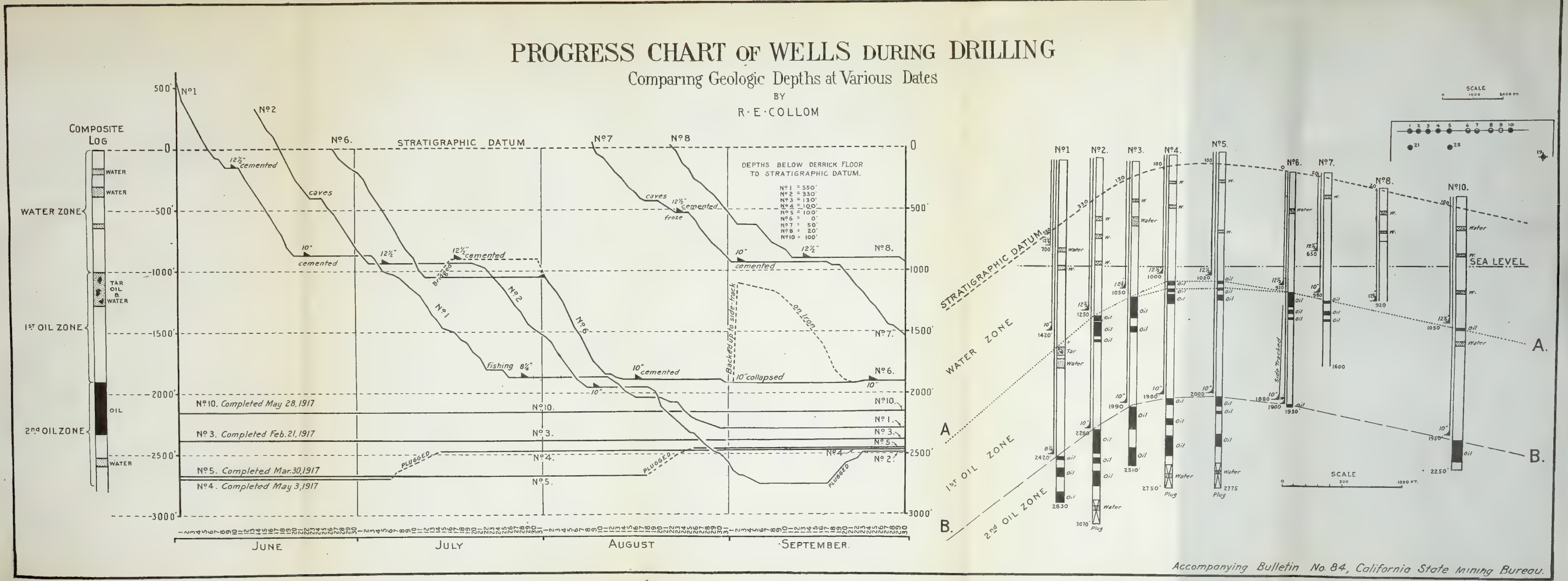
With the idea of presenting a graphic history of drilling operations with respect to the stratigraphy of the formations penetrated rather than the respective depths below surface, a line parallel to the line of correlation B (see cross section) is assumed at a position below which the essential depths drilled can be plotted. The distance between the line of correlation and stratigraphic datum can be chosen arbitratily.

In certain localities where some definitely known stratum or formational marker exists—such as "Red rock," in the Coalinga East Side field, or "Bottom of blue shale," in the Casmalia field—the line of correlation of this stratum, in the various wells may be used as stratigraphic datum.

When such a stratum, as the one referred to, exists in a group of wells, one progress chart can be made for the entire group, irrespective of their location.

On the accompanying cross-section stratigraphic datum is drawn through zero depth, that is derrick floor at Well No. 6, so that all corrections for differences from surface to stratigraphic datum in each of the wells will be plus. In this position also the drilling records with respect to the principal upper water strata and other formations of importance can be plotted.

The data on the Progress Chart are shown with respect to time and depth. A convenient vertical scale is 100 feet to 1 inch. The depths drilled per day here shown would be unusual for anything but illustration. Progress in drilling is plotted from the daily tour records. It is not necessary, for plotting, to figure corrections between depths below surface and depths below stratigraphic datum. A graphic scale may



PROGRESS CHART OF WELLS DURING DRILLING

Comparing Geologic Depths at Various Dates

BY

R·E·COLLOM

Accompanying Bulletin No. 84, California State Mining Bureau.

FIG. 8.

merely be placed in such a position on the chart as to automatically correct for the distance of the derrick floor above or below the stratigraphic datum line.

At the left end of the progress chart is a composite graphic log of formations between stratigraphic datum and the bottom of the stratigraphically deepest well in the group.

All lines of correlation are horizontal on the Progress Chart. Drilling operations in any well, plotted as the work progresses can be referred across the chart to the composite log for a check on the formational progress of the work.

As formations logged in certain wells may not be logged, although present, in a well being drilled, the combination of conditions, such as water sands, caves, shells, etc., for all wells of a group, in a composite log is a useful guide, although it should not displace the ordinary cross-section for accurate work.

In preparing cross-sections, where the correlations are definitely known stratigraphic datum can be used as the base line, instead of sea level. As on the Progress Chart, this will make the lines of correlation horizontal and is a convenient method for comparison of relative depths, thickness of formations and other inter-related features.

The Progress Chart gives a graphic history of operations in all the wells of a group. For example, reading up the vertical line for August 1, 1917, on the attached Progress Chart, it is easy to tell how many wells in the group were completed or in the oil sand at that date, also what wells were drilling or standing cemented.

The Progress Chart could be used to advantage in the comparison of drilling records, either as to personnel of crews or methods of drilling. A comparison under this system would be more accurate, because of more nearly equal formational conditions, than a comparison by plotting to depths below surface.

CHAPTER III.

LOS ANGELES AND ORANGE COUNTIES.

By M. J. KIRWAN, Deputy Supervisor.

Names of Fields.

Operations requiring the attention of this office include eight developed oil fields lying within the boundaries of Los Angeles and Orange Counties.

The name Whittier-Fullerton Oil fields follows common usage to include all fields east of the city of Los Angeles; namely Olinda, Brea Cañon, Whittier, Coyote Hills, Montebello and Puente.

In addition to the above the Salt Lake field located immediately west and the Newhall field about 30 miles northwest of the city of Los Angeles, are included in the district.

Geology.

The geology of the various fields in the district was covered briefly in Bulletins Nos. 73 and 82 and other publications of the State Mining Bureau.

However, additional geological data which has been obtained since these bulletins were published will be found under the divisions relating to the various fields in the following pages.

General Statement.

The entire production of oil in this district was produced by wells in Los Angeles and Orange counties.

The data used in the following tables relative to number of producing wells and their production were taken from production reports filed by the operators with the department.

The number of wells listed; number of producing wells; number of logs filed; number of graphic logs; average daily production of oil and water per producing well (for June 1918); percentage of water and number of acres of proved oil land, are shown by fields in Table 1. "Wells Listed" include new wells, wells drilled and abandoned wells.

TABLE 1.

Field	Wells listed	Logs filed	Graphic logs	Number of wells accounted for by production reports	Number of wells actually producing, according to production reports	Average daily production		Average daily production per producing well		Percentage of water	Proved oil land acreage
						Barrels of oil	Barrels of water	Barrels of oil	Barrels of water*		
Coyote Hills	271	236	228	192	186	39,669	2,428	213	13	5.7	2,021.75
Olinda	357	229	220	275	258	7,788	1,461	30	5.6	15	1,366.43
Brea Canon	90	77	76	68	64	4,243	1,830	66	28	30	280.16
Puente	88	3	2	44	44	54	5	1.2	.1	8.5	225
Whittier	274	224	204	159	148	2,755	2,364	18	16	46	526.30
Montebello	89	18	18	22	22	16,985	1,620	772	73.6	8.7	180.50
Salt Lake	411	389	384	282	267	2,949	1,998	11	7.4	40.4	1,016.3
Newhall	212	57	35	80	79	327	364	4.1	4.6	52.6	201.13
Miscellaneous	16	10	6	--------	--------	--------	--------	------	------	------	--------
Totals	1,808	1,243	1,173	1,122	1,068	74,770	12,070	70	11.3	13.8	5,817.57

The following table (Table 2) is a comparison of the number of wells actually producing; their average daily production of oil and of water; average daily production per producing well; and percentage of water, for all fields in the district during the month of June, for the last two fiscal years.

Study of the table shows that there was an increase of 91 producing wells, and an increase of 29,578 barrels in the average daily fluid production, of which 28,236 barrels were oil and 1342 barrels were water, for June, 1918 over June, 1917. The table also shows that the average daily production of oil per producing well rose from 47.6 barrels in June, 1917, to 70.0 barrels in June, 1918. The percentage of water of the total fluid production decreased from 18.8 per cent to 13.8 per cent during the same period.

Data similar to that in the foregoing tables are given under their respective fields in the following pages. It may be noted that there was little change in the number of producing wells and their production during the past year for all fields, except Coyote Hills and Montebello where there was a decided increase in the production of oil.

TABLE 2.

Month and year	Number of wells actually producing	Average daily production		Average daily production per producing well		Percentage of water
		Bbl. oil	Bbl. water	Bbl. oil	Bbl. water	
June, 1917	977	46,534	10,728	47.6	11	18.8
June, 1918	1,068	74,770	12,070	70	11.3	13.8

The following table (Table 3) shows a comparison of the average daily production of wells which were completed previous to July 1, 1917, for June, 1917 and June, 1918.

TABLE 3.

Month and year	Number of wells actually producing	Average daily production		Average daily production per producing well		Percentage of water
		Bbl. oil	Bbl. water	Bbl. oil	Bbl. water	
June, 1917	977	46,534	10,728	47.6	11	18.8
June, 1918	996	35,474	9,801	35.6	9.8	21.6

Study of table 3, shows that of the wells completed prior to July 1, 1917, there were 19 more wells producing in June, 1918, than June, 1917. This is accounted for mainly by wells which were shut down in June, 1917, and others which were undergoing repairs during this month, and which were producing in June, 1918. There are some cases where companies failed to properly report all wells producing until recently.

During the last fiscal year there was a decline of 11,987 barrels in the total average daily fluid production, of which 11,060 barrels were oil and 927 barrels were water. There was a decline of 13.2 barrels in the average daily production of fluid per producing well of which 12.0 barrels were oil and 1.2 barrels were water.

The following table (Table 4) shows by fields the number of wells completed during the last fiscal year; the number of these wells actually producing in June, 1918; their average daily production of oil and water; the average daily production of oil and water per producing well and the percentage of water for this month. This table shows that the greatest increase in production of oil was in the Coyote Hills field and the greatest increase in water was in the Montebello field.

TABLE 4.

Field	Number of wells		Average daily production		Average daily production per producing well		Percentage of water
	Completed during year	Actually producing	Barrels oil	Barrels water	Barrels oil	Barrels water	
Coyote Hills	29	28	21,494	405	767.6	14.5	1.9
Olinda	13	13	1,190	211	91.5	16.2	15.1
Brea Canon	1	1	39	.3	39	.3	.1
Puente							
Whittier	10	8	317	46	39.6	5.7	12.7
Montebello	20	20	16,255	1,605	812.8	80.2	9
Salt Lake							
Newhall	3	2	1.3	2	.7	1	60
Totals	76	72	39,296.3	2,269.3	545.8	31.5	5.5

In connection with Table 4 it will be interesting to note that one well in the Olinda field produced 46.8 per cent, one well in the Whittier field 67.0 per cent and one well in the Montebello field 60.5 per cent of all water shown in the Table for their respective fields. For information relative to the probable source of water entering these wells see summary of water conditions under their respective fields.

A comparison of the production of oil and water and percentage of water produced by wells in all fields completed previous to the last fiscal year, with wells completed during the last fiscal year is given for the month of June, 1918, in the following table: (Table 5)

TABLE 5.

Date wells completed	Number of wells actually producing	Average daily production		Average daily production per producing well		Percentage of water
		Bbl. oil	Bbl. water	Bbl. oil	Bbl. water	
Previous to last fiscal year	996	35,474	9,801	35.6	9.8	21.6
During last fiscal year	72	39,296	2,269	545.8	31.5	5.5
Totals, June, 1918	1,068	74,770	12,070	70	11.3	13.8

The foregoing table shows that wells completed during the last fiscal year produced 52.6 per cent of the oil and 18.8 per cent of the water produced by all wells in the district during June, 1918. Further discussion of data in table 5 is given under summary of water conditions in the following pages.

A comparison may be made from the following table (Table 6) of written notices received and written decisions made during the last two fiscal years ending June 30 of each year. Three hundred and two more notices were received and 388 more decisions were made during the last year than the previous fiscal year, indicating the relative difference in amount of work handled in the office during the last two years.

TABLE 6.

Classification of notice or decisions	Year 1916-1917		Year 1917-1918	
	Notices	Decisions	Notices	Decisions
Relating to drilling of new wells	90	86	260	273
Relating to deepening or redrilling of wells	35	38	70	75
Relating to abandonment of wells	33	33	39	37
Test of water shut-off	108	96	199	256
Totals	266	253	568	641

Table 7 shows by fields the number of wells completed during the last fiscal year, the number of wells producing June, 1917, the number of wells producing June, 1918, and the net gain in the number of producing wells.

TABLE 7.

Field	Wells completed during fiscal year; producing 1918	Producing June, 1917	Producing June, 1918	Net gain in producing wells. June, 1918
Coyote Hills	28	161	186	25
Olinda	13	251	258	7
Brea Canon	1	62	64	2
Puente		44	44	
Whittier	8	139	148	9
Montebello	20	2	22	20
Salt Lake		243	267	24
Newhall	2	75	79	4
Miscellaneous				
Totals	72	977	1,068	91

It will be noted that the Salt Lake field shows a net gain of 24 producing wells for June, 1918, over June, 1917, though no new wells were completed in this field. This is accounted for by the fact, that certain wells which were idle in June, 1917 have since been placed upon the producing list and, in a few cases, a failure to properly report wells in the former year.

The following table (Table 8 shows a comparison, by fields, for the month of June, 1917, and June, 1918, of the relative amount of water produced by individual wells. The wells have been divided into three classes as follows: 0-20 barrels; 20-40 barrels and 40 or more, barrels of water per producing day.

TABLE 8.

Field	Number of wells producing 0-20 barrels water		Number of wells producing 20-40 barrels water		Number of wells producing 40 barrels, or more, water		Total number of wells	
	1916-1917	1917-1918	1916-1917	1917-1918	1916-1917	1917-1918	1916-1917	1917-1918
Coyote Hills	134	154	10	12	17	20	161	186
Olinda	237	239	8	13	6	6	251	258
Brea Canon	47	49	3	4	12	11	62	61
Puente	44	44	----------	----------	----------	----------	44	41
Whittier	116	123	7	9	16	16	139	148
Montebello	2	14	----------	----------	----------	8	2	22
Salt Lake	210	236	13	11	20	20	243	267
Newhall	72	74	2	3	1	2	75	79
Totals	862	933	43	52	72	83	977	1,068

The data in Table 8 was taken from maps prepared by the department of the various fields showing by symbols the relative amount of water produced daily by individual wells during the month of June for both 1917 and 1918. Separate maps of the different fields were prepared for each year. On these maps all producing wells are shown in triangles, squares and circles. Triangles colored yellow were used for wells producing 0-20 barrels of water. Squares colored blue for wells producing 20-40 barrels of water and circles colored red for wells producing 40 barrels and over, per producing day. The use of the different colors, particularly the red, gives prominence to the different well classifications and readily show the areas affected by water.

The following table shows total number of barrels of oil and water and percentage of water produced during the fiscal year by fields, (1) by wells completed prior to July 1, 1917, (2) by wells completed during the fiscal year, and (3) by all wells in the district.

TABLE 9.

Field	Total oil and water produced by wells completed prior to July 1, 1917			Total oil and water produced by wells completed during fiscal year			Total oil and water produced by all wells during fiscal year		
	Bbl. oil	Bbl. water	Per cent water	Bbl. oil	Bbl. water	Per cent water	Bbl. oil	Bbl. water	Per cent water
Coyote Hills	7,565,004	822,333	9.8	1,178,948	72,201	1.7	11,743,952	894,534	7.1
Olinda	2,703,103	393,850	12.7	206,318	39,049	15.9	2,909,421	432,899	12.9
Brea Canon	1,614,068	661,755	29	1,172	24	2	1,615,240	661,779	29
Puente	19,415	1,838	8.6	----------	----------	------	19,415	1,838	8.6
Whittier	1,016,740	942.188	48.1	85,713	71,492	45.5	1,102,453	1,013,680	48
Montebello	312,209	3,583	1.1	2,951,180	210,700	6.6	3,263,389	214,283	6.1
Salt Lake	1,134,797	764,975	40.3	----------	----------	------	1,134,797	764,975	40.2
Newhall	118,464	130,662	52.6	825	1,994	70.7	119,289	132,656	52.7
Totals	14,483,800	3,721,184	20.5	7,424,156	395,460	5.1	21,907,956	4,116,644	15.8

Summary of Water Conditions.

Study of Table 9 shows that the total fluid produced during the fiscal year by wells completed prior to July 1, 1917, was 18,204,984 barrels, of which 14,483,800 barrels were oil and 3,721,184 barrels were water, a water percentage of 20.5 per cent. Fluid produced during the fiscal year by wells completed during said year totaled 7,819,616 barrels, of which 7,424,156 barrels were oil and 395,460 barrels were water, or a water percentage of 5.1 per cent.

The total fluid produced by all wells during the fiscal year was 26,024,600 barrels, of which 21,907,956 barrels were oil and 4,116,644 barrels were water—or 15.8 per cent water.

A further study of the table shows that all fields with the exception of Olinda, Montebello and Newhall showed a decrease in the percentage of water produced by the wells completed during the fiscal year compared to wells completed prior to that date. The production figures are taken up in more detail under the respective fields in the following pages. However, it may be well to note briefly at this point the fields in which the percentage of water of the new wells is greater than that of the wells drilled prior to July 1, 1917. Three wells out of a total of 13 wells completed in the Olinda field during the fiscal year produced 76.7 per cent of all water produced by the new wells, during said year. One was probably drilled into water below the oil bearing formations, as the company is at present engaged in plugging the lower portion of the well. The other two are located near an old well, which was drilled into water bearing formations below the upper oil sands and was improperly plugged. The owners having decided that the water in the new wells is due to this condition are replugging the old well. One well in the Montebello field produced 70.3 per cent of all water produced by 20 new wells completed in this field during the past fiscal year. The source of this water, as pointed out under the discussion of the Montebello field, is probably an intermediate water between the upper and lower oil zones.

In the Newhall field one well out of a total of 3 completed produced in one month 66.8 per cent of the total amount of water produced by the new wells during the entire fiscal year. This well has been plugged and abandoned.

In the Whittier field, although the table shows that the percentage of water in the wells completed during the fiscal year, is less than that shown by wells completed prior to July 1, 1917, a great improvement has been noted since repair work has been started on one well in the field which previously had produced 65.7 per cent of all the water produced by new wells in this field during the last fiscal year. After taking this well from the producing list, the remaining new wells averaged 12.7 per cent water in their production in comparison with 15.5

per cent water when this well was producing. The six wells mentioned above in a total of 76 completed during the fiscal year, produced 229,410 barrels of water out of a total of 395,460 barrels, or 58 per cent of the total water produced by all new wells completed during the fiscal year. With the exception of the well in the Montebello field, repair work has been started in order to eliminate the water troubles in these wells.

The following paragraphs contain a comparison of water conditions in June, 1917, with water conditions in June, 1918.

There was an increase of 28,236 barrels of oil and an increase of 1,342 barrels of water for the entire district during June, 1918, as against the same month in 1917. Wells completed during the fiscal year averaged 5.5 per cent water in their total fluid production for June, 1918, while wells completed previous to the fiscal year averaged 21.6 per cent water in their total fluid production for the same month. The number of barrels of water per producing well per day remained practically the same, namely 11, for June, 1917, and 11.3 for June, 1918. The decrease in the percentage of water of the total fluid produced in the district from 18.8 per cent in June, 1917, to 13.8 per cent in June, 1918, is accounted for mainly by the large increase of practically clean oil by new wells in the Coyote Hills field. One well in the Montebello field, while it averaged over 3200 barrels of oil per day, produced 990 barrels of water per day, accounting for 43.6 per cent of the water produced in June by all wells in the district completed during the fiscal year.

The Montebello field furnished 20 out of the 72 new wells completed during the year and producing in June, 1918. These wells averaged 1605 barrels of water per day during this month, or about 71 per cent of all water produced in this district by wells completed during this year. These wells averaged 80.2 barrels of water each per day and 9.0 per cent of their total fluid production was water. Aside from the Montebello field, other wells completed in the district during the fiscal year made a daily average of 12.8 barrels of water per well per day during June, 1918, and 2.9 per cent of the total fluid production during this month was water.

There was a decrease of 927 barrels or 8.6 per cent in water, produced daily by wells completed prior to the last fiscal year in June, 1918, as against the same month in 1917. This decrease is accounted for largely by a number of wells which were plugged and abandoned or not pumped on account of the small production of oil, and large production of water.

In general companies in this district make an earnest effort to determine closely the amount of water produced by each of their wells.

There are, however, a few companies who do not make an appreciable effort to determine the amount of water produced by their wells and in some cases report wells as making little or no water when it is known that they make considerable water. Members of the department have visited many properties for the purpose of giving assistance as to the proper method of making out production reports. Some companies with wells whose production is fairly constant and which produce small amounts of oil and water are required to file reports only once every three months.

In all cases where full approval of the department was given as to depth and test of water shut-off, it was necessary in only one case to redrill a well to shut off "top" water.

In the case mentioned it is probable the trouble resulted from water below, rather than from above the oil formations which were penetrated. In view of the test or tests witnessed, by the department, at each new well, it is probable that the greater number, or nearly all such wells produce what water they make from sources below the shut-off point. Frequently wells are drilled too deep so as to penetrate water-bearing formation below the oil measures from which it is desired to produce and have to be plugged near the bottom.

Among the most difficult problems presented to the department is the supervision of wells penetrating water-bearing strata between oil-bearing formations, for the purpose of producing from below the water. Such water is generally known as "intermediate" water. Certain phases of this problem are dealt with elsewhere in this report.

Graphic Logs, Peg Models and Cross Sections.

A total of 1173 graphic logs have been drawn, or an increase of 296 graphic logs over last year. Nearly all of these logs were drawn in the San Francisco office of the department. During the last year "memorandum" or advance copies of logs were received from nearly every company drilling new wells. Graphic logs of these wells were kept up to date by the local office, as the information was received, and were of much assistance in rendering decisions relative to proposed shut-off depths in new wells; a total of 80 graphic logs are being so drawn.

At the end of the fiscal year peg models had been constructed covering 10,880 acres or 17 square miles. This is an increase of 9,200 acres over similar previous construction. Models have now been constructed covering practically all of each field except Brea Cañon, Salt Lake and Newhall. Models of these fields will be constructed as rapidly as possible. All of the models have been constructed to a scale of 100′ to 1″ and the more important portions of them set up in a special room 18′ by 30′. The models are kept up to date showing both the com pleted and drilling wells. The construction of peg models has recently been begun by the Petroleum Development, Union Oil, Petroleum Midway and Red Star Petroleum companies, covering certain portions of their properties in this district. Some of the other large companies, probably, will begin the construction of models in the near future. A number of companies, both large and small, use the models made by the department to secure estimates of depth at which water should be shut off in proposed wells and in some cases the depth to which wells may be safely drilled so as to penetrate as much oil formation as possible without encountering water below.

A brief description of the value of a peg model and the method of constructing models which have been erected in the various field offices of this department is given on pages 64 and 65 of Bulletin No. 82, Second Annual Report of the State Oil and Gas Supervisor.

Cross Sections.

A number of cross sections have been drawn for use in supplementing data furnished by peg models. In nearly every case the cross sections were made by pasting graphic logs, in their true position, as to elevation and location, on tracing cloth and blue prints made. Further data as to methods employed to study underground conditions is given under the discussion of the various fields in the following pages.

Method of Operations.

In general, operators in this district have displayed a willingness to co-operate with the department to obtain accurate information relative to their wells. The department desires to see an improvement in the system employed by some companies in securing and compiling information relative to the production of their wells. This information is of vital importance to the companies involved as well as to this department, as it furnishes the basis by which it can be determined whether a well is being profitably produced.

In a few cases it has been necessary to call to the attention of a company, inaccuracies in measurement of casing and depth of wells. As an example of this, a well in the Coyote Hills field, by the use of an incorrect sand line measurement, was reported to be 3646′ deep with $8\frac{1}{4}''$ casing cemented at a depth of 3626′. At the time the test of water shut-off was witnessed by this department, it was found that the casing was actually cemented at a depth of 3649′ instead of 3626′ as reported, thus necessitating a change of 23′ which had to be apportioned in the log of the well. This error was caused by using a sand line measurement of 232′ 6″ in measuring the depth of the well, while the true measurement when measured by a representative of this department with a steel tape was found to be 234′, thus introducing an accumulative error of 1′ 6″ every time the derrick was "strung over." It is evident that a careful record of the casing put into this well was not kept, or the discrepancy of the measurement of the depth at which the casing was cemented would have been found.

In the course of testing wells many interesting features have been observed. In several cases it was found that water was entering a well and the operator claimed the water was encountered in formations below the shoe of the water string. Subsequent tests demonstrated that the water was coming from above the shoe of water string. In some instances large quantities of cement were forced back of the casing and in one case in the Montebello field circulation to the surface back of the water string was established. In one instance in the Olinda field, the owner of a well which was tested by this department claimed that oil-bearing formations which had been penetrated below the shoe of the water string carried a certain amount of water, thus accounting for the water present in the well at the time of the test. To substantiate his claim he cited the production of a neighboring well, the water content of which equalled the amount of water present in the well being tested. Upon recommendation of this department, a cement plug was placed below and extended up into the water string. Subsequent tests showed the same amount of water entering the well, conclusively demonstrating that the water present in the well at the various tests was due to a casing leak. This trouble might have been avoided and the company saved considerable time and expense had a casing test been made previous to drilling out the cement plug before test of water shut-off. It is the practice of some operators in this district to make casing tests on all wells previous to drilling out the cement plug in the bottom of the casing and the department desires to commend such practice, as results obtained at such tests have revealed the existence of a number of casing leaks.

The use of the rotary method of drilling is becoming more prevalent, especially in the newer fields in the district. In the Montebello field it is the general practice, with a few exceptions, to drill into the oil-bearing formations with rotary tools, allow the bottom of the hole to fill up when underreamed with reamings and cement the water string upon the plug formed by these reamings. The well is then usually "drilled in" with standard tools, though in some cases the rotary system is used throughout the drilling of the well.

In the western portion of the Coyote Hills field the usual practice is to set a string of 10″ casing at an average depth of about 2950′ with rotary tools. The well is then drilled ahead with standard tools and the 8¼″ casing cemented as a water string after which the well is usually completed with the rotary system. The companies operating in the eastern portion of the Coyote Hills field, as a general rule, set the water string with the rotary system and drill the well into the oil-bearing formations with cable tools.

In the Olinda field, the rotary system was recently tried but the companies using the system decided that it was not adapted to drilling in the area in which it was tried and resumed the use of standard tools. The latter system is in general use throughout the field at present.

In the Brea Cañon field the rotary system has been tried and a few wells are being drilled with rotary tools, but the majority of the wells sunk in this field use standard tools.

In the Whittier field the use of standard tools is almost universal, as is also the case in the Puente and Newhall fields.

There were no new wells drilled in the Salt Lake field during the past fiscal year.

The number of casing leaks found in this district during the last year was greater, per well tested for water shut-off, than in former years. This is probably accounted for by more casing tests having been made and the quality of the casing used not being up to the previous standard. Most of the casing leaks were eliminated by perforating the water string a short distance above the shoe of the next outside casing and forcing cement through the perforation, cementing the two strings of casings together so as to prevent the passage of water up between them. A casing leak found in the water string of one well in the Coyote Hills field, 585′ above the shoe of the next outside casing, was repaired by perforating the water string 103′ below the shoe of the outside casing and forcing cement through the perforation. The cement evidently passed up back of the water string and between it and the next casing, as vibration was found in the water string 400′ above the shoe of the next outside casing. The perforation in this case was about 100′ above the shoe of the water string.

There were several cases where bailing tests extending over a period of several days exhausted the water entering a well through a leak in the water string. In these cases it is probable that water standing back of the water string drained out down to the point of the leak and that no additional water was passing back of the water string and the next outside casing.

One well in the Whittier field showed an increase of over 100′ of water per day when the casing was first tested and gradually exhausted after bailing for about a week. In this case the fluid was all bailed out each day down to the top of the cement plug in the bottom of the water string.

Legal Action.

It was necessary to resort to legal action because of the manner of drilling Baldwin Well No. 4, of the Red Star Petroleum Company, Sec. 6, T. 2 S., R. 11 W., S. B. B. & M.

In the Notice of Intention to commence drilling this well, the company proposed to shut off water at a depth of 1800′, and estimated that oil-bearing formation should be encountered at this depth. In reply to this notice the department recommended that the company shut off water above the first oil-bearing formation encountered in the well, and recommended that the company secure samples of formation every 10′ in drilling, beginning at a depth of 1450′, and that said samples be tested with chloroform or ether to determine whether or not they were oil bearing.

When a depth of 1511′ had been reached in drilling the Deputy Supervisor visited the well and found that no samples had been taken. Upon returning to the well at a later date the Deputy Supervisor secured sample of formation, which was taken from the rotary bit at a depth of 1512′, and upon testing the sample with chloroform found that it carried crude oil. The superintendent of the property was advised relative to this and he finally agreed to discontinue drilling and cement 12½″ casing at a depth of 1475′. This agreement was entered into with the distinct understanding that oil-bearing formation had not been encountered above a depth of 1475′.

The 12½″ casing was cemented at a depth of 1475′, as agreed upon, on June 29, 1918. Following the date of cementing, evidence was furnished this department, and to the District Attorney on July 2, 1918, by the three drillers[1] that worked on this well, that oil-bearing formations had been encountered at a depth of 1395′, or 80′ above the point at which the well was cemented.

The matter of drilling this well was taken up by the department with the District Attorney's office and a complaint against the agent and general manager of the company was sworn to on July 5, 1918. This complaint read in part as follows:

> "did then and there to wit, on the 26th day of June 1918, wilfully and unlawfully hinder and delay the enforcement of the law in that the evidence of encountering oil-bearing formations was deliberately concealed by wilfully rendering a false and fraudulent report, dated June 26, 1918, which failed to show, and did not show, the presence of oil-bearing formations, as having been encountered in said well, or the depth thereof, or character of the same, whereas, in truth and in fact, such oil-bearing formations had theretofore; to wit, on or about the 24th day of June, 1918, been encountered in said well."

The report mentioned in the complaint was a signed copy purporting to be the log of this well, giving record of formations encountered down to a depth of 1512′.

During the trial, which was held in the Justices' Court of Los Angeles County, the three drillers, who had drilled this well to a depth of 1512′, testified that first oil-bearing formation was encountered in this well at a depth of 1395′, or 80′ above the depth at which the 12½″ casing was cemented. Each of these three drillers testified that he had received instructions on other wells which he had worked on, under the same management, not to report any oil or gas showings on the log of the well, and not having had a change of instructions, he pursued the same policy in making out the log of the well under consideration. One of these drillers testified, during the trial, that acting under direct instructions from the foreman that a five-gallon can was used to remove the evidence of crude oil from the rotary ditch, previous to the arrival of the representative of this department.

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[1] See pages 59 to 72, *ante*.

The Red Star Petroleum Company filed with this department a copy of an analysis made, by R. O. Wrana, chemist, of sandy shale secured from a depth of 1512′. This analysis stated that "notwithstanding the comparatively large amount of oil extracted it does not originate in the shale. The absence of asphalt and its red color clearly demonstrate this. It is evidently drippings from the tools."

Copy of analysis made by Smith-Emery Company, chemist, furnished the department on June 26, 1918, gives the following data:

"Oil, per gram (reduced to decimal part of one)	.00285
Color of oil	dark brown."

It developed during the trial that a supplementary or corrected copy of analysis was received by the Red Star Petroleum Company from Smith-Emery Company, chemists, on July 2, 1918, in which it was stated that the oil contained in the shale was *crude oil.* The latter information reached the department in the form of testimony by one of the witnesses for the defendant.

Study of the complaint, a portion of which was quoted above, shows that the company was not charged with failure to report oil at a depth of 1512′, as it was agreed between the Deputy Supervisor and superintendent that casing should be cemented, and was actually cemented, at a depth of 1475′. The complaint does, however, specifically charge the company with having filed a log which failed to show that oil-bearing formations were encountered above a depth of 1475′. (Said log also failed to show that oil-bearing formation was encountered below a depth of 1475′.) The approval of the department given to the company to cement the 12½″ casing, at a depth of 1475′, would not have been given had it been known that such procedure would actually shut off 80′ of oil-bearing formation. It should be noted that chemical analyses were made of formation from this well *after* the presence of crude oil had been noted by the Deputy Supervisor.

After hearing evidence for about four days the court dismissed the case. The greater portion of the evidence introduced by the defendant related to other wells which are located in various fields of the state.

There were 23 barrels of oil in the well when test of water shut-off was witnessed by a member of this department, when the hole was open to 1482′ or 7′ below the shoe of the 12½″ casing. Following the test of water shut-off, the well was deepened and tested in stages, down to a depth of 1800′. The tests showed that no water-bearing formations were penetrated from the shut-off point (1470′) to a depth of 1800′ and that practically all formations penetrated between these depths carried oil. There were, therefore, several hundred feet of oil-bearing formations, which did not carry water, above the depth at which the company originally proposed to shut off water. However, the company excluded these behind 10″ casing cemented at a depth of 1745′, and deepened the well.

Notices and Decisions.

The following table gives a summary by fields of written original and supplementary notices received and decisions made in this district during the fiscal year.

TABLE 10.

District No. 1—Fields	New wells				Tests		Deepen or redrill				Abandon			
	Original		Supp.				Original		Supp.		Original		Supp.	
	Notices	Decisions	Notices	Decisions	Notices	Decisions	Notices	Decisions	Notices	Decisions	Notices	Decisions	Notices	Decisions
Coyote Hills	19	21	34	44	51	100	14	14	3	6	13	14	6	4
Olinda	17	17	8	14	18	16	6	5	1	1	1	1	1	1
Brea Canon	1	1	2	2	3	4	2	1	2	2	2	1	------	------
Puente	1	1	1	1	3	3	------	------	------	------	1	1	------	------
Whittier	15	16	10	10	31	35	8	13	8	8	1	1	------	1
Montebello	73	72	62	57	79	81	1	1	------	------	1	1	------	------
Salt Lake	------	------	------	------	3	3	4	5	2	1	------	1	2	2
Newhall	9	9	4	4	11	10	16	16	3	2	4	3	1	1
Miscellaneous	3	2	1	2	------	4	------	------	------	------	5	4	1	1
Totals	138	139	122	134	199	256	51	55	19	20	28	27	11	10

Supplementary notices were filed by operators where new or changed conditions made it necessary to supplement the original notice. The decisions listed as "Supplementary" in Table 10 were made after receipt of supplementary notices and in most cases related to mechanical operations such as shooting and plugging and cementing of casing after failure to shut off water in the first attempt. Study of this table shows the relative amount of activity in the various fields of the district.

LIST OF COMPLAINTS.

There were only two complaints received during the fiscal year which required a detailed investigation by the department.

John C. Tuffree et al.
vs.
Fullerton Great West Oil Company.

On March 22, 1917, verbal complaint was entered against Fullerton Great West Oil Company well No. 3, Section 19, T. 3 S., R. 9 W., S. B. B. & M., by Mr. John C. Tuffree, representing the ownership of the land on which this well was located, stating that the well had been pumping water for several months and requesting the department to make an investigation concerning the condition of the well. Upon receipt of this complaint the matter was taken up with the company, which in reply proposed to redrill the well. The department called the attention of the company to the fact that casing had been cemented several hundred feet below the productive oil measures in adjoining wells Nos. 1 and 2 on the property, and suggested that the company take this fact into account when filing their proposed notice of intention to redrill.

The Fullerton Great West Oil Company placed a shot in the lower portion of the well and put in a 10′ cement plug. Following this work, the well was pumped for several months, when it was found that the shooting and plugging had not greatly improved the condition of the well. The matter of repair work was again taken up with the company by the department after several extensions of time had been given the company. A notice of intention to abandon the well was then filed, and upon receipt of this notice the department furnished the company with a detailed list of specifications covering shooting and plugging work necessary to protect all productive oil-bearing formations penetrated in the well. The work of abandonment was carried out by the company in accordance with the specifications issued, and final approval of the work was given the company by the department.

Brea Cañon Oil Company
vs.
Union Oil Company.

The attention of the department was called, on March 2, 1918, by the superintendent of the Brea Cañon Oil Company to the water condition of Union Oil Company "Stearns" well No. 53, Section 1, T. 3 S., R. 10 W., S. B. B. & M., Brea Cañon field. The Union Oil Company "Stearns" well referred to is located near the west line of their property in Section 1, adjoining the property of the Brea Cañon Oil Company.

The Brea Cañon Oil Company stated that they were drilling well No. 29, located near the Union Oil Company "Stearns" well No. 53, and that they expected to complete their well in a few months and that it may be affected by water from the Union "Stearns" well No. 53.

Records filed by the Union Oil Company showed that their "Stearns" well No. 53 was completed in July, 1912, and that the initial production of this well was 3000 barrels of fluid per day, which cut about 0.5% water. Production reports filed by the company show that the amount of water produced by this well has been fairly constant during the last year, and that the production of oil decreased about 50 barrels per day. At the time the complaint was entered, the well made about 125 barrels of oil and about 130 barrels of water per day.

The matter of the complaint was taken up by the department with the Union Oil Company, and in reply they state that no work had been done on the well for the past several years that, in their opinion, would be responsible for any increase in its water production and that they attributed the increase in water in the well to the work being done by the Brea Cañon Oil Company near their property. The Union Oil Company requested information relative to the condition of a well drilled near their "Stearns" well No. 53 which possibly was the source of the water entering the latter well.

In view of the fact that Brea Cañon Oil Company well No. 29 has not been completed, the department allowed the matter to rest pending developments in the latter well.

ORDER NO. 6.

CALIFORNIA STATE MINING BUREAU

DEPARTMENT OF PETROLEUM AND GAS.

Report on Test of Water Shut-off.

No. T 1-222.
Los Angeles, Cal, May 29, 1918.

Mr. I. W. Fuqua,
Los Angeles, Cal.,
Agent for Petroleum Midway Company, Ltd:

DEAR SIR:

Your well No. 1, Darlington, Section 31, T 1 S., R. 11 W., S. B. B. & M., Montebello Oil Field, in Los Angeles County, was this day tested for shut-off of water. Mr. C. C. Thoms, designated by the supervisor, was present as prescribed in Section 19, Chapter 718, Statutes 1915, and there were also present H. A. Davis, Superintendent; J. B. Case, Inspector; R. L. Peeler, Geologist; W. H. McHenry, driller; G. W. Husted, tool dresser. Location of water tested, top. Depth and manner of water shut-off, 10″ casing, reported cemented at 2308′, with 15 tons of cement, by Huber & Wilson process. Casing record of well, 12½″ cemented at 2224′, collapsed at 1564′. Reported total depth of hole, 2312′ 6″. Bailer went to 2310′ 9″ and brought up tablespoonful of material which may have been formation. Water bailed out to 2312′ 6″ at 2.30 p.m., May 28, 1918. At 3 p.m., May 29, 1918, bailer run to 2310′ 9″. Result of bailing test, about 10 gallons of fluid of which about one quart was oil, balance water. Bailer at successive increasing depths, beginning at 2227′ to 2300′, showing no fluid above a depth of 2300′. The bailer was then run to 2310′ 9″, and brought up about 10 gallons of fluid as noted above.

Following is copy of log record of this well, dated May 10, 1918, giving a record of certain formations penetrated:

"Reports, dated March 16 and March 20, read:

Top of formation.	Bottom of formation.	
2.175	2,269	Hard sandy shale.
2,269	2,275	Sandy shale.

Reports, as above, should read:

2,224	2,227	Hard sandy shale.
2,227	2,235	Sandy shale showing trace oil and gas.
22-35	22-40	Brown sandy shale, small showing oil and gas.
2.240	2,245	Brown shale and coarse sand.
2,245	2,289	Brown sandy shale showing oil and gas."

Following is similar copy of log record dated May 15, 1918:

"Top of formation.	Bottom of formation.	
2,289	2,310	Brown shale showing oil and gas.
2,310	2,315	Hard brown shale.
2,315	2.316	Sticky blue shale.

May 13, depth 2,316 feet, stands cemented at 2,308 feet."

Both of these log records were received from the Petroleum Midway Company, Ltd.

On account of the fact that certain oil-bearing formations penetrated in this well above a depth of 2308′, as shown by log record given above, have been shut off, it is hereby ordered that the Petroleum Midway Company, Ltd., do such work and conduct such tests as may be necessary to demonstrate to the satisfaction of the Supervisor that said oil-bearing formations are properly protected from water. Such tests shall be conducted June 10, 1918. This department will have a representative present at the well to witness said test. The date of test may, upon application of the owner, be changed from time to time in the discretion of the Supervisor.

R. P. McLaughlin,
State Oil and Gas Supervisor.
By M. J. Kirwan, Deputy.

This order was appealed to the District Oil and Gas Commissioners, who ordered further tests to determine if water was prevented from passing around shoe of 10″ casing to lower levels in the well. They ordered that no tests, as in the premises of the supervisor's order, were necessary.

COYOTE HILLS FIELD.

This field produced more than one-half of the oil produced in District No. 1 during the month of June, 1918. The field now contains 2022 acres of proved oil land, an increase of 154 acres during the last year.

Table 1 shows that there were 186 wells producing in June, 1918. These wells made a total daily average of 39,669 barrels of oil and 2428 barrels of water for this month, or a daily average of 213 barrels of oil and 13 barrels of water per producing well per day. The average daily production of oil increased about 50 per cent over the production of June, 1917, during the last year, while daily average production of water decreased about 8 per cent. Figures compiled by the department show that there was an increase in the average daily production of oil amounting to 13,384 barrels and a decrease of water amounting to 203 barrels during June, 1918, as against June, 1917. Twenty-nine wells were completed during the fiscal year, and 28 of these wells produced in June, 1918, and made a total daily average of 21,494 barrels of oil and 405 barrels of water during this month.

This is an average of 768 barrels of oil and 14.5 barrels of water per producing well per day, which is an average percentage of 1.9 per cent water. Wells completed prior to the last fiscal year averaged 18,175 barrels of oil and 2023 barrels of water per day during June, 1918. This is a decline in their daily production of 8110 barrels of oil and 608 barrels of water as against their daily production in June, 1917.

Wells completed prior to July 1, 1917, made a total fluid production of 8,387,337 barrels during the last fiscal year. Of this amount 7,565,004 barrels were oil and 822,333 barrels were water, or 9.8 per cent water. Wells completed during the last fiscal year made a total fluid production during this year of 4,251,149 barrels. Of this amount 4,178,949 barrels were oil and 72,201 barrels were water, or 1.7 per cent water. During the last fiscal year all wells in this field made a total fluid production of 11,743,952 barrels of oil and 894,534 barrels of water, or 7.1 per cent water. Table 8 shows that, during June, 1918, there were 186 wells producing. Of this number 154 wells produced from 0–20 barrels of water per day, 12 wells produced from 20 to 40 barrels of water per day, and 20 wells produced 40 barrels or more water per day. This is an increase of 20 wells producing 0–20 barrels of water, 2 wells producing 20–40 barrels of water, and 3 wells producing 40 or more barrels of water per day for June, 1918, as against the same month in 1917. The location of wells making 40 barrels or more water per day is as follows: One well near the north line of the N. W. ¼ of Sec. 20, one well near the center of the N. E. ¼ of Sec. 19, four wells in the S. E. ¼ of Sec. 13, and one well in the W. ½ of the N. W. ¼ of Sec. 24, all in T. 3 S., R. 9 W., S. B. B. & M. Wells making similar amounts of water in T. 3 S., R. 10 W., S. B. B. & M. are located as follows: Two wells in the S. ½ of the N. E. ¼ of Sec. 22, one well in the N. E. corner of the N. W. ¼ of Sec. 21, one well in the S. E. ¼ of Sec. 17, two wells along the north line of the N. W. ¼ of Sec. 19, and one well along the south line of the S. E. ¼ of Sec. 18. The following wells located in T. 3 S., R. 11 W., S. B. B. & M., are also producing 40 barrels or more water per day: Four wells in the N. E. ¼ of Sec. 24 and two wells in the S. E. ¼ of Sec. 13.

From the foregoing it will be noted that wells producing 40 barrels or more of water per day are fairly well distributed throughout the field, and, with a few exceptions, the water trouble in them is probably local, due to the physical condition of the wells themselves, rather than the result of a widespread water-saturated area or encroaching edge water.

An interesting and profitable development in this field occurred at Standard Oil Company M/C well No. 44, Sec. 18, T. 3 S., R. 10 W., S. B. B. & M., in which 10″ casing was cemented above an upper oil zone shut off by all other wells on the property. The well is located near the apex of the anticline and therefore in a favorable location in which to make a test of upper oil formations, which at this location is about 250′ above the oil-bearing formations produced from by all other wells on the property. The upper oil zone was tested upon recommendation of the department. In accordance with our recommendation, the well was drilled 30′ below the shut-off point, and when tested for production, according to production reports, averaged 290 barrels of oil and 0.1 barrel of water per day for the first 25 days. Following the test the company proposed to deepen. Water was evidently encountered in deepening as the lower portion of the well was plugged, after which it averaged about 80 barrels of oil and 70 barrels of water per day. In deepening, the well was drilled to within 100′ of the point where the company proposed to shut off water above the zone from which all other wells were producing. The results of tests made at this well show that there are two productive zones on this property with probable intermediate water between them. From results obtained at early wells drilled in this part of the field it was claimed that clean oil could not be produced from the first zone. The demonstration at M/C well No. 44 shows that early wells probably either did not have water shut off above, or penetrated intermediate water below this zone. The first oil zone has been found over an area about as large as a quarter section and has not been tested by wells drilled since M/C well No. 44.

A peg model has been constructed covering all of the western and nearly all of the eastern portion of this field. The model of the latter part shows distinctly that there are two oil zones in the S. ½ of the N. E. ¼ of Sec. 23 and S. ½ of N. W. ¼ of Sec. 24, T. 3 S., R. 10 W., S. B. B. & M. Recent developments indicate that this zone does not extend as far north along the east line of Section 23 as the second oil zone. A test made of the first zone in a well located on the southern edge of the present producing area along the west line of Section 24 showed that the first zone had comparatively little oil in the sands comprising the upper part of the zone and that there was either edge water in the lower part of the zone or water immediately below. The well in which the test was made is being deepened, water to be shut off below the first zone and the second zone tested for production. The north and east limits of the first zone are fairly well defined. This zone is worth protecting from water, as five wells obtaining their production from it during June, 1918, averaged 129 barrels of oil and 3 barrels of water per day. Future wells drilled in the western part of the N. E. ¼ of Sec.

23, T. 3 S., R. 10 W., S. B. B. & M., possibly could develop oil in commercial quantities from the upper zone, and later, if deemed advisable, deepen to the second zone.

Repair work on wells located on both sides of the south line of Sec. 13, T. 3 S., R. 10 W., S. B. B. & M., caused a material reduction in the water production of two wells in this area. Other wells in the vicinity will probably be worked upon during the coming year in order to reduce, if possible, the amount of water produced by them. One well which was producing a large amount of water and a small amount of oil was plugged and abandoned during the fiscal year.

Following is a tabulation showing written notices received and written decisions made for the Coyote Hills field during the year:

Section Township Range	Company	New wells				Test of water shut-off		Deepen or redrill				Abandon			
		Orig.		Supp.				Orig.		Supp.		Orig.		Supp.	
		Notices	Decisions	Notices	Decisions	Notices	Decisions	Notices	Decisions	Notices	Decisions	Notices	Decisions	Notices	Decisions
21-3-10	Union Oil	----	----	2	3	1	1	----	----	----	----	----	----	----	----
22-3-10	Union Oil	----	----	----	----	1	1	----	----	----	----	----	----	----	----
22-3-10	Standard	----	----	3	3	3	1	----	----	----	----	----	----	----	----
23-3-10	Union	----	----	1	1	2	5	----	----	----	----	----	----	----	----
23-3-10	Amalgamated Oil	1	1	----	----	3	6	1	1	----	----	1	1	----	----
24-3-10	Strain, Thos.	----	----	----	----	----	----	1	1	1	1	----	----	----	----
21-3-10	Petroleum	----	----	----	2	1	3	----	----	----	----	----	----	----	----
24-3-10	Amalgamated Oil	2	2	1	1	2	5	----	----	----	----	----	----	----	----
28-3-10	Union	----	----	1	2	1	1	----	----	----	----	----	----	----	----
4-3-11	Union	----	----	1	1	1	----	----	----	----	----	----	----	----	----
13-3-11	Standard	----	----	1	1	2	3	----	----	----	----	1	1	----	----
24-3-11	Standard	1	1	4	7	4	9	1	1	----	----	1	1	1	1
18-3- 9	Union	1	1	----	----	2	4	2	2	1	3	----	----	----	----
18-3- 9	Standard	----	----	----	----	----	----	----	----	----	----	1	1	1	1
19-3- 9	San Diego Consolidated	----	----	----	1	1	3	2	1	----	----	1	1	1	----
19-3- 9	Colokla	----	----	----	----	----	----	2	2	----	2	----	----	----	----
19-3- 9	Providential Oil	----	----	----	----	----	----	1	1	----	----	1	1	----	----
19-3- 9	Fetterman	----	----	----	----	----	8	----	----	----	----	2	3	----	----
19-3- 9	Fullerton Great West	----	----	----	2	----	6	2	1	----	----	1	1	1	----
29-3- 9	Union	----	----	----	----	----	1	----	----	----	----	----	----	----	----
8-3-10	Tri-state	----	----	----	----	----	2	----	----	----	----	1	1	----	----
13-3-10	Amalgamated	----	----	----	----	1	1	1	2	----	----	1	1	1	1
17-3-10	Standard	1	1	6	6	5	8	----	----	----	----	----	----	----	----
18-3-10	Standard	5	7	8	8	15	24	1	2	1	----	2	2	1	1
19-3-10	Standard	6	6	6	6	5	6	----	----	----	----	----	----	----	----
28-3-10	Standard	2	2	----	----	1	2	----	----	----	----	----	----	----	----
	Totals	19	21	34	44	51	100	14	14	3	6	13	14	6	4

Study of the above tabulation shows that the Standard Oil Company and Amalgamated Oil Company carried on the greater portion of development work, the greatest activity being in the western portion of the field. Of the 29 wells completed in this field during the fiscal year, 14 are located in the eastern part, or what is sometimes referred to as "East Coyote." The remaining 15 wells are located in the western part, or "West Coyote" field. Wells in the western part of the field made a much higher average per producing well than those in the eastern part during the year. One well in the western part of the field produced nearly 1,100,000 barrels of oil and 13,000 barrels of water during the last 11 months.

OLINDA FIELD.

The major portion of the development work in this field was carried on during the fiscal year by the Union Oil Company and Petroleum Development Company. Reference to Table 4 shows there were 13 wells completed during the year. Drilling was commenced on 17 wells. The production of all wells completed during the fiscal year amounted to 91.5 barrels oil and 16.2 barrels of water each per day during the month of June, 1918. Wells completed prior to July 1, 1917, made a total daily average of 6598 barrels of oil and 1250 barrels of water during June, 1918. This is a decrease for these wells of 1000 barrels of oil and an increase of 324 barrels of water for June, 1918, as against June, 1917. Wells completed during the fiscal year produced a total of 206,318 barrels of oil and 39,049 barrels of water during the year. The production for the fiscal year of wells completed prior to July 1, 1917, amounted to 2,703,103 barrels of oil and 393,850 barrels of water, making a total fluid production for the field during the fiscal year of 3,342,320 barrels, of which 2,909,421 barrels were oil and 432,899 barrels were water.

Table 8 shows 239 wells produced from 0–20 barrels of water, 13 wells from 20–40 barrels of water, 6 wells 40 or more barrels of water during June, 1918. Maps prepared by the department show that wells making 40 or more barrels of water per day are distributed throughout the field, excepting two localities, where there are a number of these wells in a group. Active repair work is in progress at one of these groups of wells in which an old well drilled several hundred feet below present productive measures is being cleaned out and re-plugged.

In view of the change in the system of one company in this field of reporting the amount of all water produced by their wells instead of the amount of water carried by oil in suspension after draining off the free water, there appears to be an increase of 407 barrels of water per day for this company. This accounted largely for the apparent increase in water of the total fluid production for June, 1918, as against June, 1917. There are other companies in this field who are still using this system and consequently fail to file correct production reports with the department.

There has been practically no extension of the proved area in this field by wells completed during the fiscal year. Nearly all of such wells are located within the area considered proved in the Second

Annual Report. At present there is one well producing for every 5.3 acres of proved land in this field.

As a result of recent study of underground conditions on the property of the Petroleum Development Company, in this field, one well which had been producing for approximately 17 years from a depth of 664 feet was deepened to 1465 feet and the production of the well increased from 3 barrels per day to 80 barrels per day. The gravity of this oil is 19.8° Baumé and the water content amounted to only 0.26 barrels. As a result of the success of this work the company are at present engaged in deepening other wells on the property.

The following tabulation is a summary of notices received and decisions rendered by the department for this field during the past year. Reference to this table shows that nearly all the development in this field related to the drilling of new wells.

Section--Township--Range	Company	New wells				Test of water shut-off		Deepen or redrill				Abandon			
		Orig.		Supp.				Orig.		Supp.		Orig.		Supp.	
		Notices	Decisions	Notices	Decisions	Notices	Decisions	Notices	Decisions	Notices	Decisions	Notices	Decisions	Notices	Decisions
7-3- 9	Union	2	2	2	4	1	1	1	1	----	----	----	----	----	----
8-3- 9	Petroleum Development	5	5	2	4	12	8	3	2	----	----	----	----	----	----
8-5- 9	West Coast	1	1	2	2	2	2	----	----	----	----	----	----	----	----
8-3- 9	Olinda Land	----	----	----	----	----	1	1	1	----	----	----	----	----	----
8-3- 9	Columbia Oil Producing	1	1	----	----	----	----	----	----	----	----	----	----	----	----
8-3- 9	Union	2	2	2	4	3	4	1	1	1	1	----	----	----	----
17-3- 9	Olinda Land	2	2	----	----	----	----	----	----	----	----	----	----	----	----
17-3- 9	Union	3	3	----	----	----	----	----	----	----	----	----	----	----	----
16-3- 9	Olinda Land	1	1	----	----	----	----	----	----	----	----	1	1	1	1
	Totals	17	17	8	14	18	16	6	5	1	1	1	1	1	1

BREA CAÑON FIELD.

Table No. 1 shows that there were 64 wells producing in this field during June, 1918. Table 9 shows that wells completed prior to July 1, 1917, had a total fluid production during the past fiscal year of 2,275,823 barrels. Of this amount 1,614,068 barrels were oil and 661,755 barrels were water, or 29 per cent of the total fluid production was water. Only one well was completed during the past fiscal year and produced during June, 1918, a total of 1196 barrels of fluid, of which amount 1172 barrels were oil and 24 barrels were water, or the water amounted to 2 per cent of the total fluid produced. The production of all wells in the field during the fiscal year amounted to 2,277,019 barrels, of which amount 1,615,240 barrels were oil and 661,779 barrels were water, or 29 per cent water.

Wells completed prior to July 1, 1917, produced at the average rate of 4204 barrels of oil and 1830 barrels of water per day during June.

1918. This is a decrease in the daily production of these wells as shown in June, 1917, of 513 barrels of oil and 202 barrels of water.

During June, 1918, there were 49 wells producing from 0–20 barrels of water, 4 wells producing from 20–40 barrels of water, and 11 wells producing 40 or more barrels of water daily.

There are two well defined areas in Section 2, T. 3 S., R. 10 W., S. B. B. & M., in which wells are seriously affected by water. One of these areas is located along the north line of the section in which 4 wells each averaged 73 barrels of water per day during June, 1918.

The other area is located in the southwestern part of the developed portion of the section, in which area 10 wells each averaged 133 barrels of water daily during the same month.

These two groups, comprising 14 wells, produced 87 per cent of all the water produced in the field during the month of June, 1918.

The water condition of the affected areas has shown only slight improvement during the fiscal year, which would indicate that the water is being produced from water-bearing formations penetrated in certain of the wells and is probably not return drilling water, as was believed to be the case by some of the operators in the field. This is further borne out by the fact that there was little drilling activity in the field during the past fiscal year. The large amounts of water used in wells being drilled or repaired could, no doubt in some cases, be reduced by "mudding up" certain sands known to be very porous, thus reducing the amount of water used and consequently the amount of water allowed to enter the oil-bearing formations.

Acting upon recommendations of this department, the Birch Oil Company successfully plugged the lower portion of their well No. 12 on Section 2, T. 3 S., R. 10 W., S. B. B. & M., and reduced the daily water production of this well from about 250 barrels to about 35 barrels and increased the daily production of oil from about 20 barrels to 35 barrels. The production of oil from this well will probably be greatly increased when casing opposite upper oil sands, formerly cased off, is perforated. Recent tests made of the production of an adjoining well on this property show a considerable betterment in its water condition, possibly due to work performed on well No. 12.

The following tabulation giving a summary of notices received and decisions rendered by the department during the fiscal year shows that there was little activity here during the year:

Section-Township-Range	Company	New wells				Test of water shut-off		Deepen or redrill				Abandon			
		Orig.		Supp.				Orig.		Supp.		Orig.		Supp.	
		Notices	Decisions	Notices	Decisions	Notices	Decisions	Notices	Decisions	Notices	Decisions	Notices	Decisions	Notices	Decisions
2-3-10	Brea Canyon	----	----	----	----	----	----	1	----	2	2	----	----	----	----
2-3-10	Columbia Oil Producing	1	1	----	----	2	2	----	----	----	----	----	----	----	----
2-3-10	Birch	----	----	2	2	1	2	1	1	----	----	2	1	----	----
	Totals	1	1	2	2	3	4	2	1	2	2	2	1	----	----

PUENTE FIELD.

The term Puente field, as used in this report, includes in addition to the known productive area of the old Puente field, located mainly in Sections 34 and 35, T. 2 S., R. 10 W., S. B. B. & M., in the Puente Hills, the western portion of the Rancho La Puente, west of the town of Puente, upon which the Shell Company of California is operating. Actual development work was carried on in various parts of this field by the Shell Company of California, Petroleum Development Company. Copa De Ora and Gold Seal Petroleum companies. Up to the present time no oil has been produced by any of these new wells, the only production being reported from wells in the old field.

Table 1 shows there were 44 wells producing in the month of June, 1918, all of these wells having been completed prior to July 1, 1917. These wells produced a total of 19,415 barrels of oil and 1838 barrels of water, or 8.6 per cent of the total fluid produced was water. The average daily production of this field for June, 1918, was 54 barrels of oil and 5 barrels of water. This shows a decrease of 8 barrels of oil and 1 barrel of water from the average daily production for June, 1917.

The following table is a summary of notices received and decisions made by this department relative to this field during the past fiscal year:

Section-Township-Range	Company	New wells				Test of water shut-off		Deepen or redrill				Abandon			
		Orig.		Supp.				Orig.		Supp.		Orig.		Supp.	
		Notices	Decisions	Notices	Decisions	Notices	Decisions	Notices	Decisions	Notices	Decisions	Notices	Decisions	Notices	Decisions
2-10	Petroleum Development	----	----	----	----	3	1	----		----		----	----	----	
9-2-9	A. T. Currier	----	----	1	1	----	2	----	----	----	----	1	1	----	
11-2-11	Shell	1	1	----	----										
	Totals	1	1	1	1	3	3	----		----	----	1	1	----	----

WHITTIER FIELD.

There are 526 acres of proved oil land in the field, an increase of 25 acres since the previous fiscal year.

Table 1 shows that 148 wells were producing in this field in June, 1918. During this month these wells averaged 2,755 barrels of oil and 2,364 barrels of water per day, or an average daily production of 18 barrels of oil and 16 barrels of water per producing well per day. Table 8 shows that, during June, 1918, there were 123 wells producing from 0–20 barrels water, 9 wells producing from 20–40 barrels water, and 16 wells producing 40 or more barrels water daily.

There were 10 wells completed during the fiscal year. These wells produced a total of 85,713 barrels of oil and 71,492 barrels of water during the year. Wells completed prior to July 1, 1917, produced a total of 1,016,740 barrels of oil and 942,188 barrels of water. This makes a total production of 1,102,453 barrels of oil and 1,013,680 barrels of water, or 48 per cent water, for all wells during the last fiscal year.

Wells completed prior to July 1, 1917, produced an average of 2,438 barrels of oil and 2,318 barrels of water per day during June, 1918. This is a decrease in the daily production of these wells of 784 barrels of oil and 306 barrels of water for June, 1918, as against their production for June, 1917.

The number of producing wells and their production of oil and water for June, 1917, and June, 1918, is given in the following tabulation:

	Number producing wells	Average daily production		Average daily production per producing well		Percentage of water
		Bbl. oil	Bbl. water	Bbl. oil	Bbl. water	
June, 1917	139	3,222	2,624	23	19	44.9
June, 1918	148	2,755	2,364	18	16	46

Study of the above tabulation shows that the Whittier field produced 467 barrels of oil and 260 barrels of water less per day in June, 1918, than the same month of 1917. The average daily production per producing well declined 5 barrels in oil and 3 barrels in water during the year. These figures show that a larger drilling campaign than during the last year will have to be carried on in order that this field may maintain its present oil production. There is little or no doubt but that the amount of water produced by certain wells in this field seriously affects their oil production.

One well, located near the N. W. corner of Section 26, T. 2 S., R. 11 W., S. B. B. & M., completed during the fiscal year, produced a total of 47,016 barrels of water, or 65.1 per cent of the water produced by all wells completed during the year. This well was drilled through the first and second oil zones and into the third oil zone. Recent repair work begun and tests made on this well indicate that the source of water is intermediate water between the second and third oil zones. This well did not produce during June, 1918.

The well referred to under Table 4 as producing 67 per cent of all water produced in June, 1918, by wells completed during the fiscal year is located near the west line of the S. E. ¼ of Section 22, T. 2 S., R. 11 W., S. B. B. & M. This well averaged about 30 barrels of oil and 40 barrels of water per day. This well effected a complete shut off above the upper oil, and from the fact that the well was drilled deeper stratigraphically than neighboring wells, it is probable that water-bearing formations were encountered below the shut-off point. The structure of this field, and more particularly Sections 22, 23 and 26, T. 2 S., R. 11 W., S. B. B. & M., is given in considerable detail in Bulletin No. 82, Second Annual Report of the State Oil and Gas Supervisor. In Section 26, previously mentioned, there are three distinct oil zones with intermediate water between each zone. The distance from the top of the first zone to the top of the second zone averages about 500′, and the average distance from the top of the second zone to the third zone is about 600′. Developments during the fiscal year indicate that the prospects of extending the southern portion of the field in a southeasterly direction in Section 25 of the above-mentioned township and range are probably better than in any other direction. One well located near the N. W. corner of the S. W. ¼ of Section 25, completed in April, 1918, in accordance with recommendations issued by this department, was drilled to a certain depth into the first oil zone, and tested in order to determine the productiveness and water content of the zone at this well. The well averaged 77 barrels of oil and 4 barrels of water per calendar day up to July 1, 1918. The results of this test indicate the value of the first oil zone in this part of the field. Further deepening of this well should show whether or not the first oil zone continues and also the position of probable intermediate water between the first and second oil zones. Six wells produced only from the first oil zone during the fiscal year and averaged about 60 barrels of oil and 15 barrels of water each per calendar day. The source of the water produced by two of these wells was probably foreign to the zone itself, resulting possibly from intermediate water below and in another case failure to make a complete shut-off above the zone.

There are 8 wells producing only from the second zone on Section 26, T. 2 S., R. 11 W., S. B. B. & M. The average daily production of these wells amounted to 98.8 barrels of oil and 0.35 barrels of water per day during the fiscal year. One well producing from the third zone only averaged 39.1 barrels of oil and 0.0 barrels of water during the same time. This well is located near the north line of the N. W. ¼ of the section. A test of the productiveness of the third zone is being made on a well located near the center of the section. A shut-off to be made immediately above the third zone, the second zone to be protected by the use of mud and cement. All other wells on this section probably produce from more than one zone and make nearly all the water produced by wells in this section. This indicates that the source of water produced by the latter wells is between the zones, or intermediate water, or failure to exclude water from above the first zone.

Water should be effectively shut off above the first oil zone in each new well drilled in the southeastern part of the field, so that this zone may be properly protected from water above it even though a shut-off is made below the zone in order to produce from the second zone. The matter of protecting the first zone from intermediate water between it and the second zone, in wells shutting off this zone to produce from lower zones, is one that merits the careful consideration of all operators concerned.

The fact that the total fluid produced by this field during the last fiscal year amounted to 48 per cent water shows the necessity of certain repair work on old wells and a definite policy in the matter of drilling new wells in order that the various oil zones which may be shut off receive the protection that their value warrants. The department recommended the use of mud-laden fluid to aid in protection of the first zone in wells cementing casing below it, the purpose of the mud being to seal the porous formations, even though only temporarily to permit the rising of a column of cement to the desired height back of the casing to be cemented, and keeping the cement in its proper position for a sufficient length of time for it to take its initial set. The mud-laden fluid method of aiding in the protection of oil zones shut-off does not seem to be very well understood by operators in this field and, therefore, has not been properly tried so as to determine its effectiveness.

Prospect work was started in two areas, one well being located in the N. W. ¼ of Section 15, and the other two wells in unsurveyed Sections 8 and 9, all in T. 28, R. 11 W., S. B. B. & M.

The following tabulation shows the relative amounts of work instituted during the past fiscal year by various operators in this field:

Section-Township-Range	Company	New wells				Test of water shut-off		Deepen or redrill				Abandon			
		Orig.		Supp.				Orig.		Supp.		Orig.		Supp.	
		Notices	Decisions	Notices	Decisions	Notices	Decisions	Notices	Decisions	Notices	Decisions	Notices	Decisions	Notices	Decisions
25-2-11	Fullerton	1	1	----	----	1	1	1	1	1	1	----	----	----	----
25-2-11	Standard	1	1	1	1	2	5	----	----	----	----	----	----	----	----
23-2-11	Central	1	1	----	----	----	----	3	3	----	----	1	1	----	1
22-2-11	Home	----	----	----	----	----	----	1	2	----	----	----	----	----	----
22-2-11	Standard	1	2	4	4	9	8	1	1	5	5	----	----	----	----
22-2-11	Central Oil	1	1	----	----	1	1	1	1	----	----	----	----	----	----
15-2-11	Central	1	1	----	----	----	1	----	----	----	----	----	----	----	----
9-2-11	Montebello Oil Syndicate	1	1	----	----	----	----	----	----	----	----	----	----	----	----
8-2-11	Montebello Mascot	1	1	----	----	----	----	----	----	----	----	----	----	----	----
26-2-11	Standard	7	7	5	5	18	19	1	5	2	2	----	----	----	----
	Totals	15	16	10	10	31	35	8	13	8	8	1	1	----	1

MONTEBELLO FIELD.

The average daily production of oil increased in this field from 852 barrels in June, 1917, to 16,985 barrels in June, 1918. Reference to Table 1 shows that there were 22 wells producing in June, 1918, and that their average daily production per well was 772 barrels of oil and 73.6 barrels of water. During the fiscal year there was a total fluid production of 3,477,672 barrels, of which 3,263,389 barrels were oil and 214,283 barrels were water.

One well, located in the N. E. ¼ of Section 1, T. 2 S., R. 12 W., S. B. B. & M., produced a total of 1,328,137 barrels of oil and 150,722 barrels of water, or a total of 40.7 per cent of all the oil and 70.3 per cent of all the water produced in the field. This well was drilled 1675 feet below the first oil-sand, and probably penetrated water-bearing formation below the shut-off point. A number of wells have been drilled in the northeastern part of this section (Section 1), in which water above the first oil sand was shut off in the usual manner and unperforated oil strings landed from 700′ to 900′ below the first oil sand, probably making a formation shut-off. These wells were completed with a second, and in some cases a third, oil string so as to produce only from formations penetrated in the lower portion of the well.

Clean oil has been obtained from all wells finished in this manner. Such a procedure leaves considerable doubt as to protection of upper oil formations, providing intermediate water has been passed through and cased off with the upper oil sands. Future wells drilled in this area should be so planned as to locate, if possible, any intermediate water. This possibly could be done by drilling the new wells deeper stratigraphically than the wells at present producing from the upper formations and testing by stages, if necessary, to the depth from which the present deeper wells are producing. In other words, test for probable intermediate water-bearing formations between the upper and lower oil zones.

It is possible that both the water and oil bearing formations are lenticular in shape, in which case the water problem in this portion of the field will be difficult to solve and hard to handle, as in many cases it will be necessary to test deep wells before it will be known whether or not they passed through water. Wells completed in the north-central and northwestern portion of Section 6, T. 2 S., R. 11 W., S. B. B. & M., have had very little water trouble up to the present time. Practically every completed well in this area is producing from all oil-bearing formations penetrated below the shut-off point. Several of the wells here have been drilled from 1200′ to 1500′; and one well 1725′ below the shut-off point. Production reports show that none of these wells make water. Three wells along the southern edge of the area just described average from about 20 per cent to 40 per cent water and emulsion in their fluid production. The source of this water has not been determined. Two of these wells were drilled 1132′ and 762′, respectively, below the first oil sand, while the third well was drilled only 700′ below the first oil sand. All three of these wells adjoin wells drilled deeper, stratigraphically, and which produce large amounts of clean oil. The three wells under consideration are all on about the same contour, which suggests the possibility of an intermediate edge water, particularly in view of the production of clean oil from the adjoining wells up slope. One of the wells has been plugged to within about 600′ of the top of the first oil sand without materially improving its water condition. Future developments should show whether or not the water in the three wells just described has any relationship to water penetrated in the wells mentioned in the following paragraph.

Water was encountered in one well along the Standard-Union line in Section 1, T. 2 S., R. 12 W., S. B. B. & M., after drilling 559′ below the first oil sand. The lower portion of the well was plugged with cement and successfully excluded all water. Work is in progress plugging the lower portion of two other wells along this line in order to shut off water.

The results so far attained in the area under consideration show that it is comparatively safe to drill wells about 525′ below the top of the first oil sand without encountering water. In view of the wells drilled in this section which have penetrated various oil-bearing formations from 1500′ to 1700′ below their shut-off point, it seems reasonable to assume that oil-bearing formations exist below the water penetrated by wells along the Standard-Union line, and the water penetrated in these wells may be an intermediate edge water.

A well drilled in Section 2, T. 2 S., R. 12 W., S. B. B. & M., to a depth of 920′ below the shut-off point has been shot in several places and plugged with cement up to within 650′ of the shut-off point. After this plugging the well averaged about 300 barrels of oil and 100 barrels of water per day, indicating that the source of the water is above the top of the cement plug. In order to secure additional information as to the source of the water in this part of the field the owner of the well is drilling an adjoining well in which this company are planning to drill to a lesser depth stratigraphically than the top of the plug in the former well and test by pumping, and later on, if necessary, possibly deepen in stages and conduct further tests.

Two wells have been completed in the S. W. ¼ of Section 31, T. 1 S., R. 11 W., S. B. B. & M. One well was drilled 485′ and the other 595′ below the first oil-bearing formation penetrated. The former well averaged about 300 barrels of oil per day and 35 per cent water thirty days after completion. The other well produced mostly water when first tested and at present is standing with a cement plug extending 115′ from bottom.

Two wells have been completed east of the Rio Honda, in Section 6, T. 2 S., R. 11 W., S. B. B. & M. One of these wells was drilled 400′ below the first oil-bearing formation and encountered water-bearing formation near the bottom. This well has a cement plug, extending about 100′ from bottom, which shuts off the water. The other well was drilled 218′ below the first oil-bearing formation and is producing clean oil. Results obtained in certain wells drilled in this section immediately west of the Rio Honda, in which from 1200′ to 1500′ of oil-bearing formations were penetrated, indicate the possibility that productive oil formations exist below the water in the well under consideration which has the cement plug in the bottom.

Water was shut off in one of the early wells drilled in Section 6, T. 2 S., R. 11 W., S. B. B. & M. about 700′ above the first oil formation. In view of this the department recommended that the owner of the well stop drilling, and test the well before drilling below a specified depth. The result of the subsequent test showed that the well averaged over 50 per cent water in its fluid production. There is little doubt but that water from above the oil formation is entering the well as adjoining wells, down slope, drilled deeper stratigraphically are producing clean oil. The matter of repair of the well has been taken up with the owner who has been furnished the department's estimate of the depth at which water should be shut off. With a few exceptions, water was shut off above the first oil-bearing formation penetrated in each well in the field.

Operators were not required to shut off above, or protect from water, oil-bearing formations which the department considered of no commercial importance. Special importance was attached by the department to uniform stratigraphic shut-off, as some of the older oil fields of the State have been seriously damaged by neglect of such vital factor in their protection from water.

The information given in this report relative to water conditions in certain areas of the Montebello Field show that water is proving a serious obstacle in the development of this field. In order to successfully cope with this problem it will be necessary to do a certain amount of prospecting and testing. Such work should be systematically directed along proper engineering lines, taking advantage of study of peg models, cross sections, underground contour maps and chemical analyses of water produced by various wells.

The department has a complete and up-to-date peg model showing a graphic representation of all wells completed and drilling in the field. Contours of the first oil-bearing formation penetrated by the various wells has been sketched on the boards comprising the base of the model. All property and section lines are also shown. A number of cross sections have been made and all available data on chemical analyses of water from wells has been gathered. The responsibility of the future of this field rests largely upon the operators themselves, who in some cases, are not availing themselves of the benefits which would result from the employment of technical assistance.

The gravity of the oil produced in the Montebello field ranges from 14 to 28 degrees Baumé, inclusive. Wells producing from the lower formations penetrated produce the higher gravity oil. The gravity of oil produced by wells in Sec. 1 T. 2 S., R. 12 W., S. B. B. & B., located along the Standard-Union line ranges from 17 degrees to 22 degrees, inclusive. One well in N. E. ¼ of Section 2, in the same township and range, averages about 15 degrees. The oil from wells, located in the northern part of Sec. 1 T. 2 S., R. 12W., S. B. B. & M. and north western part of Section 6, T. 2 S., R. 11W., S. B. B. & M., penetrating and producing only from upper oil zone ranges in gravity from 22 degrees to 25 degrees, while the gravity of oil produced from the upper zone by wells in Section 31, and east of the Rio Honda in Section 6, T. 2 S., R. 11W., S. B. B. & M., averages about 19 degrees.

Further study of the gravity of oil produced by wells in this field may throw some light on the water problem.

History of Development.

T. 2 S., R. 12W., S. B. B. & M.

Section 1.

Drilling was commenced by the Standard Oil Company, on "Baldwin" well No. 1, the first well in the Montebello field, on December 12, 1916. This company now has 18 producing wells and 10 drilling wells in this section (see fig. 9). The Union Oil Company has six wells producing and 2 wells drilling. The Petroleum Midway and Columbia Oil Producing Company are each drilling one well.

Section 2.

The farthest westward producing wells, Standard Oil Company "Baldwin" well No. 4, located near the top of the anticline and Petroleum Midway Company "Mullholland" well No. 1, located on the south flank of the anticline are both in this section. The former well is in the N. E. ¼ and the latter well in the S. E. ¼ of the section. The Petroleum Midway Company "Howard and Smith" well No. 1, located near the S. E. corner of the S. W. ¼ was drilled to a depth of about 3375′, and after some work in sidetracking casing farther up the hole was shut down. No oil bearing formation was reported as having been penetrated in this well. The same company is drilling a well near the S. E. corner of the S. W. ¼ known as "Oswald-Stephens" well No. 1. This well is drilling at a depth of about 2800′. General Petroleum Corporation "Ralph" well No. 1, located near the south line in the S. E. ¼ is drilling at a depth of about 3100′. The Union Oil Company is drilling three wells along the north line of their property, in the S. E. ¼ of the section. The Riverside Portland Cement Company and Baldwin-Stocker Oil Estates are carrying on active development work in the N ½ of this section.

Section 3.

There are two drilling wells near the N. S. center line, in the N. ½ of this section. One of these wells is being drilled by the Interstate Oil Company and has reached a depth of 3350′. The other well "Bicknell" No. 1 was drilled by the Pan American Petroleum Company to a depth of about 3075′ and then shut down.

Section 12.

The Montebello Oil Syndicate is drilling a well near the east line of the N. E. ¼ of the section. The well has reached a depth of about 1500′.

T. 1 S., R. 12 W., S. B. B. & M.

Section 25.

The General Petroleum Corporation is drilling "Lieber" well No. 1, located in Lot 7, in the S. E. ¼ of Section 25. This well has reached a depth of about 2300′.

Section 26.

The General Petroleum Company is drilling "Garvey" well No. 1, located in the S. W. ¼ of Section 26. This well is drilling at a depth of about 2250′.

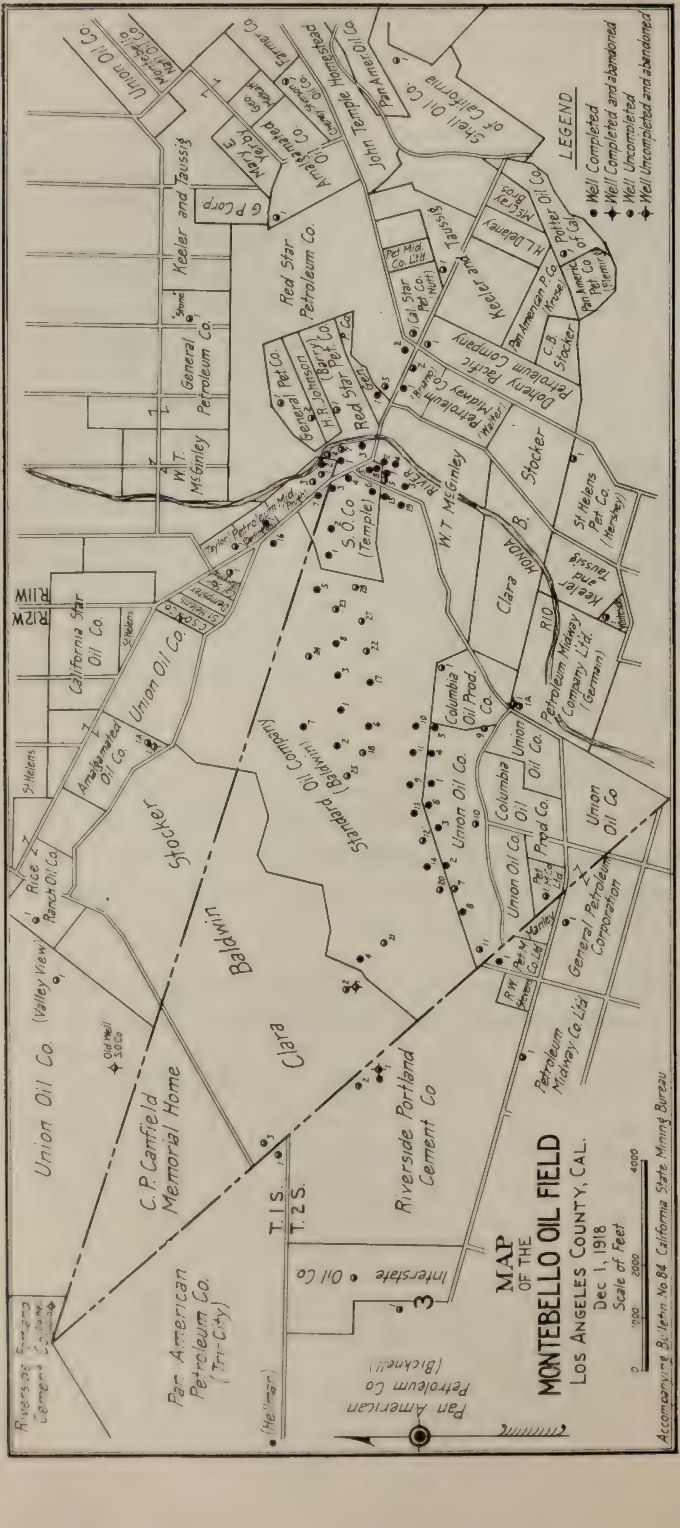

MAP
OF THE
MONTEBELLO OIL FIELD
LOS ANGELES COUNTY, CAL.
Dec 1, 1918
Scale of Feet
0
1000
2000
4000
Accompanying Bulletin No. 84 California State Mining Bureau
LEGEND
● Well Completed
✦ Well Completed and abandoned
○ Well Uncompleted
✧ Well Uncompleted and abandoned
Union Oil Co.
Montebello Nat'l Oil Co.
Farmer Co.
Mary E. Yarby
Amalgamated Oil Co.
John Temple Homestead
Pan Amer. Oil Co.
Shell Oil Co. of California
Keeler and Taussig
G P Corp.
Red Star Petroleum Co.
General Petroleum Co.
W. T. McGinley
General Pet. Co.
H. R. Johnson
Red Star Pet. Co.
Pet. Mid. Co. L'td
Cal. Star Pet. Co. (Nutt)
Taussig
H. L. Delaney
McGray Bros.
Potter Oil Co.
Pan American P. Co. (Kruse)
Pan American Pet. Co. (Flemirs)
C. B. Stocker
Doheny Pacific Petroleum Company
Petroleum Midway Co.
Stocker
St Helens Pet Co. (Hershey)
Keeler and Taussig
Petroleum Mid.
S. O. Co (Temple)
RIVER
W T McGinley
Clara B.
HONDA
RIO
Petroleum Midway Company L'td (Germain)
R11W
R12W
California Star Oil Co.
St Helens
Union Oil Co.
Amalgamated Oil Co.
Columbia Oil Prod. Co.
Union Oil Co.
Columbia Oil Prod Co.
Standard Oil Company (Baldwin)
Stocker
Rice Ranch Oil Co.
Union Oil Co. (Valley View)
Old Well S.O.Co
Baldwin
Clara
General Petroleum Corporation
Manley
Pet M Co Ltd
R.W. Stevens
Petroleum Midway Co. L'td
C. P. Canfield Memorial Home
Riverside Portland Cement Co
T.1 S.
T.2 S.
Interstate Oil Co.
Pan American Petroleum Co. (Tri-City)
Pan American Petroleum Co (Bicknell)
Riverside Portland Cement Co.
(Hellman)

FIG. 9.

Section 33.

Pan American Petroleum Company "Hellman" well No. 1, located in the S. W. corner of the section was drilled to a depth of 2450′, and shut down. No oil has been reported in this well.

Section 35.

Drilling was commenced on four wells in this section during the fiscal year. Two of the wells are located in the N. E. ¼. One of these wells, owned by the Rice Ranch Company, is drilling at a depth of about 3200′, the other well "Valley View" No. 1 owned by the Union Oil Company is drilling at a depth of about 1800′. The Pan American Petroleum Company drilled "Tri-City" well No. 1, located in the S. W. corner of the S. W. ¼, to about 3900′, without developing any oil. This well has several hundred feet of the lower portion plugged off and tests are being conducted of formations passed through in the original drilling. Adjoining well No. 3, of the Baldwin-Stocker Oil Estate was shut down when drilled to a depth of about 1400′.

Section 36.

The Amalgamated Oil Company "Connor" well No. 1, located near the center of the section is drilling at a depth of about 3250′. California Star Oil Company "Comte" well No. 1 was drilled to a depth of 1100′ and abandoned.

T. 1 S., R.11W., S. B. B. & M.

Section 28.

The Union Oil Company is drilling "Slaughter" well No. 1, located in the S. E. corner of the section. The well has reached a depth of about 2500′.

Section 31.

There are two producing wells in this section, Standard Oil Company "Baldwin" No. 16, and Petroleum Midway Company "Darlington" No. 1. "Taylor" well No. 1, owned by the latter company, was shut down after being drilled to about 2700′ when mechanical troubles developed. The latter company is drilling "Darlington" No. 2, located along San Gabriel Boulevard, between "Darlington" No. 1 and "Taylor" No. 1. California Star Oil Company drilling "Bargsten" well No. 1, known as the "Triangle" well, ceased operations, when a depth of about 3200′ had been reached. All of the foregoing wells mentioned are located in the S. W. ¼ of the section. General Petroleum Corporation "Alvitre" well No. 1, drilling at a depth of about 2950′, is located near the south line of the S. E. ¼.

Section 32.

The Amalagamated Oil Company "Durfee" well No. 1 is located near the S. E. corner of the S. W. ¼. This well is drilling at a depth of about 2800′. The Five Star Oil Company is drilling "Irwin" well No. 1, in the S. E. corner of the section and are testing formations below a depth of 3160′. The General Petroleum Corporation "Stone" well No. 1, located near the S. E. corner of the S. W. ¼ of the section has been drilled to a depth of about 3000′.

T. 2 S., R. 11 W., S. B. B. & M.

Section 5.

The Shell Company of California is drilling a well, near the east line of the N. E. ¼ of the section. The Red Star Petroleum Company are drilling "Sanchez" well No. 1, located near the north line of the S. W. ¼ of the section. The Potter Oil Company of California and Keeler and Tausig are each drilling a well in the S. W. ¼ of the section. The former well has been drilled to a depth of about 3100′ and the latter well to a depth of about 2000′.

Section 6.

The General Petroleum Corporation completed "Cruz" well No. 1. The first oil-bearing formation was penetrated in this well at a depth of 2077′. This company is drilling "Alvitre" well No. 2, located near the north line of the section. First oil-bearing formations have been reported in this well, and the well is being drilled into the oil formations, below the shut-off point. Red Star Petroleum Company "Baldwin" well No. 2, located near the S. E. corner of the N. W. ¼ of Section 6, was shut down after a depth of about 2800′ was reached. No oil was developed at this well. The same company has "Baldwin" well No. 5, offsetting General Petroleum "Cruz" well No. 1, in which oil-bearing formations were reported, and the well shut down shortly after the water string was recemented. The Red Star Petroleum Company have a total of 5 drilling wells and 2 producing wells in Section 6. The Petroleum Midway Company "Piuma-Briano" well No. 1, located in this section, is producing clean oil after the lower portion of the well had been plugged. "Piuma-Briano" well No. 2 of this company has reported first oil. "Walter" well No. 1 of the same company has been recemented after penetrating the oil-bearing formation. Both of these wells are in the east central part of Section 6, and have been shut down, after recementing. The Petroleum Midway Company have a total of 4 drilling wells and 2 producing wells in this section. Doheny-Pacific Petroleum Company "Pasadena" well No. 1, located near the S. E. corner of the N. W. ¼ of the section, were unable to test first bearing formations encountered on account of casing trouble and are now testing formations penetrated below a depth of 3035′.

The McGinley Oil Company has 4 wells producing and 1 well drilling.

Section 7.

The St. Helens Petroleum Company is operating in this section and is drilling well No. 1, located near the N. E. corner of the N. W. ¼.

Developments in the Montebello field show that the top of the anticlinal dome broadens out on its west plunge from its apex, near Standard Oil Company "Temple" well No. 3, in Section 6, T. 2 S., R. 11 W., toward Standard "Baldwin" No. 4 in Section 2, T. 2 S., R. 12 W. In view of this it is difficult to locate the exact top of the anticline in Sections 1 and 2. There are not a sufficient number of wells drilled on the east plunge of the anticline to accurately determine the exact direction of its axis. However, late drilling operations indicate that the axis of the anticline turns toward the south from its apex in Section 6. The average maximum dip of the developed portion of the south flank of the anticline near the center of Section 1, T. 2S., R. 12W., is about 20° with the direction of strike about S. 82° W. as shown by the peg model in the office of the department. Surface dips of formations here range from 25° to 50°. There is evidently a steepening in dip of the south flank of the anticline toward the south line of Section 2, T. 2S., R. 12 W., as a well in the south east corner of this section has reached a depth of about 3100′ without reporting oil bearing formations. The south flank of the anticline dips an average of about 30 degrees with the direction of strike about S. 72° W. in the center of Section 6, T. 2S., R. 11 W., in the developed area. Wells recently completed in Section 31, T. 1S., R. 11 W., show that the north flank of the anticline dips about 35 degrees from the top of the anticline toward these wells. Results reported from wells drilling north of these wells in this section, show a still greater dip or failure of the upper oil-bearing formations to extend any considerable distance beyond the completed wells referred to. Results in general obtained along the north flank of the anticline indicate that this flank has a greater degree of dip than the south flank. The productive area of the eastern end of the field should be soon determined with the present rate of development. There is comparatively little activity in the western end of the field, the major portion of present work being along the axis and on the south flank of the anticline.

Table 10 shows that notices were received by the department to drill 73 wells in this field during the fiscal year. This is 53 per cent of all such notices received during this time. Up to July 1, 1918, a total of 84 notices to drill wells in this field were received since drilling was commenced at the first well on December 12, 1916.

Following is a summary of all written notices received and decisions rendered by the department during the fiscal year.

Section-Township-Range	Company	New wells				Test of water shut-off		Deepen or redrill				Abandon			
		Orig.		Supp.				Orig.		Supp.		Orig.		Supp.	
		Notices	Decisions	Notices	Decisions	Notices	Decisions	Notices	Decisions	Notices	Decisions	Notices	Decisions	Notices	Decisions
28-1-11	Union	1	1	----	----	----	----	----	----	----	----	----	----	----	----
31-1-11	California Star Petroleum	1	1	----	----	1	----	----	----	----	----	----	----	----	----
6-2-11	Petroleum Midway	6	6	2	5	6	3	----	----	----	----	----	----	----	----
6-2-11	Red Star Petroleum	5	5	1	3	3	4	----	----	----	----	----	----	----	----
5-2-11	Keeler & Tausig	1	1	----	----	----	----	----	----	----	----	----	----	----	----
5-2-11	Potter	1	1	----	----	----	----	----	----	----	----	----	----	----	----
5-2-11	Shell Co. of California	1	1	----	----	----	----	----	----	----	----	----	----	----	----
35-1-11	Shell Co. of California	1	1	----	----	----	----	----	----	----	----	----	----	----	----
32-1-11	General Petroleum Corp.	1	----	----	----	----	----	----	----	----	----	----	----	----	----
32-1-11	Five Star	1	1	----	----	----	----	----	----	----	----	----	----	----	----
32-1-11	Amalgamated	1	1	----	----	----	----	----	----	----	----	----	----	----	----
31-1-11	Standard	1	1	----	----	1	3	----	----	----	----	----	----	----	----
31-1-11	General Petroleum Corp.	1	1	----	----	2	2	----	----	----	----	----	----	----	----
31-1-11	Petroleum Midway	2	2	----	1	2	1	----	----	----	----	----	----	----	----
6-2-11	Standard Oil	8	8	7	7	13	15	----	----	----	----	----	----	----	----
3-2-12	Pan-American Petroleum	1	1	----	----	----	----	----	----	----	----	----	----	----	----
3-2-12	Interstate	1	1	----	----	1	----	----	----	----	----	----	----	----	----
2-2-12	General Petroleum Corp.	1	1	1	1	----	----	----	----	----	----	----	----	----	----
2-2-12	Union	1	1	----	----	----	----	----	----	----	----	----	----	----	----
2-2-12	Petroleum Midway	2	2	1	1	1	----	----	----	----	----	----	----	----	----
2-2-12	Baldwin-Stocker Oil Estates	----	----	5	4	3	2	----	----	----	----	----	----	----	----
2-2-12	Riverside Portland Cement	1	1	----	----	----	----	1	1	----	----	----	----	----	----
2-2-12	Standard	1	1	5	5	3	3	----	----	----	----	----	----	----	----
1-2-12	Petroleum Midway	1	1	1	----	1	1	----	----	----	----	----	----	----	----
1-2-12	Union	5	5	7	4	7	9	----	----	----	----	----	----	----	----
6-2-11	McGinley	3	3	3	3	3	3	----	----	----	----	----	----	----	----
6-2-11	General Petroleum Corp.	1	1	----	----	----	----	----	----	----	----	----	----	----	----
6-2-11	California Star	1	1	----	----	----	----	----	----	----	----	----	----	----	----
6-2-11	St. Helens Petroleum	1	1	----	----	----	----	----	----	----	----	----	----	----	----
6-2-11	Doheny-Pacific Petroleum	1	1	----	----	----	----	----	----	----	----	----	----	----	----
33-1-12	Pan-American Petroleum	1	1	----	----	1	----	----	----	----	----	----	----	----	----
35-1-12	Pan-American Petroleum	1	2	7	4	2	3	----	----	----	----	----	----	----	----
35-1-12	Rice Ranch	1	1	1	1	2	2	----	----	----	----	----	----	----	----
35-1-12	Union	1	1	----	----	----	----	----	----	----	----	----	----	----	----
35-1-12	Baldwin-Stocker Oil Estates	1	1	----	----	----	----	----	----	----	----	----	----	----	----
36-1-12	Amalgamated	1	1	3	3	----	----	----	----	----	----	----	----	----	----
36-1-12	California Star	1	1	1	----	----	----	----	----	----	----	1	1	----	----
1-2-12	Standard	11	10	17	15	24	28	----	----	----	----	----	----	----	----
	Totals	73	72	62	57	79	81	1	1	----	----	1	1	----	----

SALT LAKE FIELD.

The total fluid production of this field during the year amounted to 1,902,772 barrels, of which 1,134,797 barrels were oil and 764,975 were water, or 40.2 per cent water.

Reference to Table 1 shows this field to have produced an average total of 2949 barrels of oil and 1,998 barrels of water per day during June, 1918. This is a decline of 487 barrels of oil and 188 barrels of water per day during the fiscal year. No wells were drilled in this field during the year.

The decrease in the amount of oil therefor represents the natural decline in the production of the producing wells.

A detailed description of work done in shutting off water penetrated below the oil-bearing formations in Rancho La Brea Well No. 41, Sec. 15, T. 1 S., R. 14 W., S. B. B. & M., by the mud-laden fluid method, as recommended by this department, is given on pages 162 to 168, inclusive, in Bulletin No. 82, Second Annual Report of the State Oil and Gas Supervisor. After the water sand below the oil sand was entered and before the well was mudded the water stood about 170′ from the surface. A total of about 770 cubic yards of adobe and 50 cubic yards of sawdust were pumped into the lower portion of the well, under a pressure of about 400 pounds per square inch. Following the final mudding operation the well was shut down. A representative of the department visited the well about three months after mudding operations had been completed and found that the water stood at the surface and that mud-laden fluid stood 140 feet from the surface.

Salt Lake Oil Company wells Nos. 329, 330, 347 and 348 in Section 22, adjoining Section 15 on the south, and Rancho La Brea Oil Company Well No. 38, were directly affected as each of these wells pumped a mud solution shortly after mudding operations were started in Rancho La Brea Well No. 41, necessitating the shut down of these wells, while the mudding operation was in progress. These wells produced a total of 9,273 barrels of oil and 50,717 barrels of water, or 84.5 per cent water during a period of one year previous to mudding operations. The same wells produced a total of 24,669 barrels of oil and 47,588 barrels of water, or 65.8 per cent water for a period of one year following mudding operations on Rancho La Brea Well No. 41. This is an increase of 15,396 barrels of oil and a decrease of 3,129 barrels of water, or a decrease from 84.5 per cent water to 65.8 per cent, due, evidently, to work performed at Rancho La Brea Well No. 41, as immediately previous to work at this well the affected wells produced only a comparatively small amount of oil and a large quantity of water. Previous to the time that water sand was penetrated in Rancho La Brea Well No. 41, the above mentioned wells averaged approximately 70 per cent water in their fluid production. The water sand in Rancho La Brea Well No. 41 had been penetrated about 15 months previous to commencement of the mudding operations. Study of the foregoing data shows that Rancho La Brea Well No. 41 was not the principal cause of the water trouble in the adjoining Salt Lake wells.

Table 8 shows that there were 236 wells producing from 0–20 barrels of water; 11 wells producing from 20 to 40 barrels of water and 20 wells producing 40 barrels or more water in the Salt Lake field during the fiscal year. There was little change from the previous year in the number of wells producing these amounts of water.

Study of the following summary of notices received and decisions rendered during the fiscal year, shows that there was very little work done on wells in this field during the year.

Section-Township-Range	Company	New wells				Test of water shut-off		Deepen or redrill				Abandon			
		Orig.		Supp.				Orig.		Supp.		Orig.		Supp.	
		Notices	Decisions	Notices	Decisions	Notices	Decisions	Notices	Decisions	Notices	Decisions	Notices	Decisions	Notices	Decisions
25-1-15	West Coast	----	----	----	----	1	1	----	----	----	----	----	----	----	----
28-1-14	Rancho La Brea	----	----	----	----	----	----	1	1	----	----	----	----	----	----
29-1-14	Garbutt	----	----	----	----	----	----	----	1	----	----	----	1	2	2
16-1-14	Rancho La Brea	----	----	----	----	1	1	3	3	2	1	----	----	----	----
15-1-14	Rancho La Brea	----	----	----	----	1	1	----	----	----	----	----	----	----	----
	Totals	----	----	----	----	3	3	4	5	2	1	----	1	2	2

NEWHALL FIELD.

The work in this field was handled from January, 1918, to June, 1918, inclusive, by Irving V. Augur, Deputy Supervisor, located at Santa Paula, on account of the field being more accessible to the Santa Paula office.

Records show that three new wells were completed in this field during the past fiscal year. These wells produced a total of 825 barrels of oil and 1994 barrels of water during this time, but as pointed out elsewhere in this report one of these wells produced in one month 1364 barrels of water, or 66.8 per cent of the total amount of water produced by the new wells during the entire fiscal year.

Wells completed prior to July 1, 1917, produced during June of that year an average of 362 barrels of oil and 325 barrels of water per day. In June, 1918, the average daily production of these wells was 326 barrels of oil and 362 barrels of water, showing that the average daily oil production of these wells decreased 36 barrels and the average daily water production increased 37 barrels.

The total fluid production of the field during the past fiscal year was 251,945 barrels, of which 119,289 barrels were oil and 132,656 barrels were water, or 52.7 per cent of the total fluid production was water.

Table 8 shows that 74 wells produced 0–20 barrels of water; 3 wells produced from 20–40 barrels of water and 2 wells produced 40 or more barrels of water daily. This shows that there are comparatively few wells producing large amounts of water. The water production during June, 1918, amounted to 4.6 barrels and the oil production was 4.1 barrels per well per producing day during this month.

The following tabulation is a summary of the notices received and decisions made by this department relative to the work in this field during the past fiscal year. Comparison of figures shown in this table with those in a corresponding table for the fiscal year of 1916–17, shown on page 169 of Bulletin No. 82, Second Annual Report of the State Oil and Gas Supervisor, show an increased activity in the work of this field. Study of these two tables shows that notices were received for 9 new wells, 11 tests of water shut-off, 16 to redrill and 4 to abandon during the past fiscal year as against notices for 4 new wells, 9 tests of water shut off, none to redrill and 4 to abandon during the 1916–1917 period.

Section Township Range	Company	New wells				Test of water shut-off		Deepen or redrill				Abandon			
		Orig.		Supp.				Orig.		Supp.		Orig.		Supp.	
		Notices	Decisions	Notices	Decisions	Notices	Decisions	Notices	Decisions	Notices	Decisions	Notices	Decisions	Notices	Decisions
2-3-17	Standard	----	----	----	----	----	----	3	3	1	----	1	1	----	----
7-3-15	Standard	1	1	----	----	2	2	1	1	----	----	1	1	----	----
20-5-16	Wheat & De Forest	1	1	----	----	----	----	----	----	----	----	----	----	----	----
19-5-16	W. W. Stabler	----	----	----	----	----	----	1	1	----	----	----	----	----	----
16-3-16	Standard	2	2	1	1	3	4	9	9	2	2	----	----	----	----
13-3-16	E. A. Clampitt	----	----	----	----	----	----	----	----	----	----	1	1	1	1
12-3-16	E. A. & D. L. Clampitt	2	2	----	----	1	----	----	----	----	----	----	----	----	----
31-4-15	June Oil	1	1	----	----	----	----	----	----	----	----	----	----	----	----
18-3-15	Buick Oil	1	1	----	----	2	2	2	2	----	----	----	----	----	----
6-3-15	Tunnel Petroleum	1	1	3	3	3	2	----	----	----	----	----	----	----	----
1-2-15	Crafton Oil	----	----	----	----	----	----	----	----	----	----	1	----	----	----
	Totals	9	9	4	4	11	10	16	16	3	2	4	3	1	1

MISCELLANEOUS FIELDS.

Dominguez Field.

During the fiscal year notices of intention to abandon 3 of the 4 wells commenced the previous year, were received. One well in this field was drilled with a rotary to a depth of 5000′; 8¼″ casing was landed in this well at a depth of 3970′. No oil-bearing formations were reported as having been penetrated. One of the wells abandoned was drilled to a depth of 3449′ and the other to 1622′ without finding oil. An effort made to develop gas in the Highland Development Company well failed on account of not being able to shut off water.

Inglewood Field.

A well was drilled in this field by the Bartolo Oil Company to a depth of 4500′ and the well plugged and abandoned without developing oil.

Newport Field.

Drilling was commenced on two wells in this field during the latter part of the fiscal year. One of these wells, owned by the Standard Oil Company, is located on Section 14, T. 6 S., R. 10 W., S. B. B. & M., and is about 500 feet northwest of the U. S. Collins Well No. 3, which reported oil at a depth of 2525′. The Collins well was never satisfactorily completed on account of water troubles. The other well is owned by the Liberty Petroleum Company and is located near Newport Bay in unsurveyed Section 23, T. 6 S., R. 10 W., S. B. B. & M. This well is northwest of two abandoned wells which were drilled by the Newport Bay Oil Company. Log of Well No. 1 of this company shows drilling was commenced in November, 1906, and the well drilled to a depth of 2763′. Sands and shales carrying oil were reported at various depths below 1800′. Drilling was commenced on the No. 3 well of this company in May, 1909. This well reported heavy oil at 1850′ and was drilled to a depth of 3200′. These wells were both abandoned and according to reports the reason for abandonment was a failure to shut off water. Oil was evidently obtained from these wells, as there is evidence of it in an old sump nearby. Oil-bearing formation has been recently penetrated in Liberty Petroleum Well No. 1 and by the use of modern methods in shutting off water, by which a complete shut off was made, is in a position to make a definite test of the oil-bearing formations which have been penetrated.

Richfield Field.

This field is situated about 3 miles east of, and takes its name from, the town of Richfield, located on the A. T. & S. F. Ry., about 9 miles east of the city of Fullerton. The field is also about 9 miles southeast of the Olinda field. Drilling was commenced by the Standard Oil Company on their first well on April 6, 1918. This well is located about 1200′ from the Santa Fe Railway, being in the unsurveyed Section 36, T. 3 S., R. 9 W., S. B. B. & M. A great deal of interest has been taken in this part of the district since oil-bearing formations were penetrated by this well. The present indications point to the development of a new field. A well drilled by the Yorba Oil Company in 1915, located about a mile northeast of the Standard Oil Company well, reported a number of oil-bearing formations from about 2000′ to 3528′. This well was drilled to 3528′ and abandoned in 1916 without producing any oil.

The following tabulation is a summary of notices received and decisions rendered by this department, relative to work in these fields, during the fiscal year.

Section. Township. Range.	Company	New wells				Test of water shut-off		Deepen or redrill				Abandon			
		Orig.		Supp.				Orig.		Supp.		Orig.		Supp.	
		Notices	Decisions	Notices	Decisions	Notices	Decisions	Notices	Decisions	Notices	Decisions	Notices	Decisions	Notices	Decisions
20-2-14	Bartolo Oil	----	----	----	----	----	4	----	----	----	----	1	1	1	1
1-4-13	General Petroleum	----	----	----	----	----	----	----	----	----	----	1	1	----	----
1-4-13	Standard	----	----	----	----	----	----	----	----	----	----	1	1	----	----
19-4-12	Union	----	----	----	----	----	----	----	----	----	----	1	1	----	----
1-4-13	Highland Development	----	----	1	2	----	----	----	----	----	----	1	----	----	----
23-6-10	Liberty Petroleum	1	----	----	----	----	----	----	----	----	----	----	----	----	----
14-6-10	Standard	1	1	----	----	----	----	----	----	----	----	----	----	----	----
36-3-9	Standard	1	1	----	----	----	----	----	----	----	----	----	----	----	----
	Totals	3	2	1	2	----	4	----	----	----	----	5	4	1	1

REPORT

By M. J. KIRWAN, Deputy Supervisor

TO

R. P. McLAUGHLIN,

State Oil and Gas Supervisor.

ON THE

MURPHY-WHITTIER PROPERTY

OF THE

STANDARD OIL COMPANY

SHOWING

Condition of Wells and Protection of Various Sands from Water.

This report has been compiled almost entirely from records on file in this office from which drawings were made, and by a study of a peg model showing all wells on the Murphy-Whittier property, together with wells on adjoining properties. Accompanying the report is a diagram showing the various wells in numerical order. The diagram was drawn with an idea of assisting in the study of individual well record and particularly to show the relationship of the three oil zones which, for the purpose of this report, are designated first zone, second zone and third zone. The vertical position of the graphic well logs, in the diagram, was arranged to show the top of the first zone connected by short lines, so as not to form a straight line, allowing the second and third zones, where penetrated by the well, to occupy positions regulated by the actual distance between these zones as shown by the logs.

Maps are given showing relative positions of wells and show by colors and symbols the average amounts of oil and water produced daily by various wells in August, 1917 (see Figs. 10 and 11).

Four cross sections also accompany this report. The cross sections show the following wells: (1) (File No. A–31) Nos. 27, 26, 25, 32, 35, 38 and 13; (2) (File No. A–32) Nos. 36, 25, 43 and 45; (3) (File No. A–33) Nos. 36, 32, 17 and 31; (4) (File No. A–34) Nos. 36, 40, 42, 39, 48, 41 and 14.

In general, the subject has been treated by individual wells, concluding with a general summary and recommendations.

The table, Fig. 12, gives data on individual wells as follows: Well number; total depth drilled; zones penetrated; zones producing; zones protected, unprotected and doubtful; average daily number of barrels of oil and of water and percentage of water produced during August, 1917, and date of completion, when known.

The following explanation of the table is given relative to protection from water of the various zones penetrated:

A zone is considered "protected" by a well when tests demonstrate that water is not entering from either above or below it.

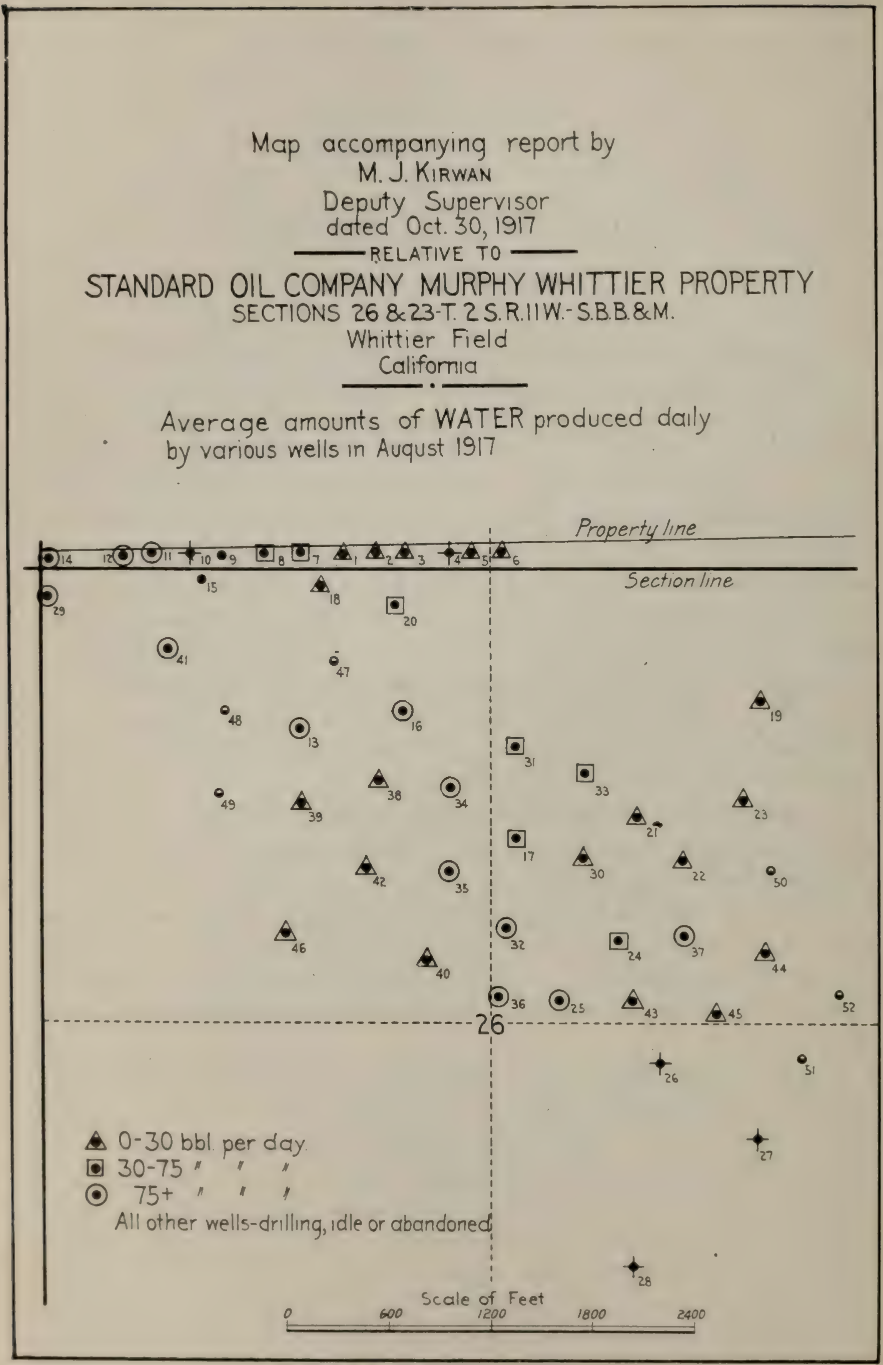

Map accompanying report by
M. J. Kirwan
Deputy Supervisor
dated Oct. 30, 1917
RELATIVE TO
STANDARD OIL COMPANY MURPHY WHITTIER PROPERTY
SECTIONS 26 & 23-T. 2 S. R. 11 W.-S.B.B.&M.
Whittier Field
California
Average amounts of WATER produced daily
by various wells in August 1917
Property line
Section line
14
12
11
10
9
8
7
1
2
3
4
5
6
15
18
29
20
41
47
48
13
16
19
31
33
49
39
38
34
23
21
17
30
22
50
42
35
32
24
37
44
46
40
36
25
43
45
52
26
26
51
27
28
▲ 0-30 bbl. per day
▣ 30-75 " " "
⊙ 75+ " " "
All other wells-drilling, idle or abandoned
Scale of Feet
0
600
1200
1800
2400

Fig. 10.

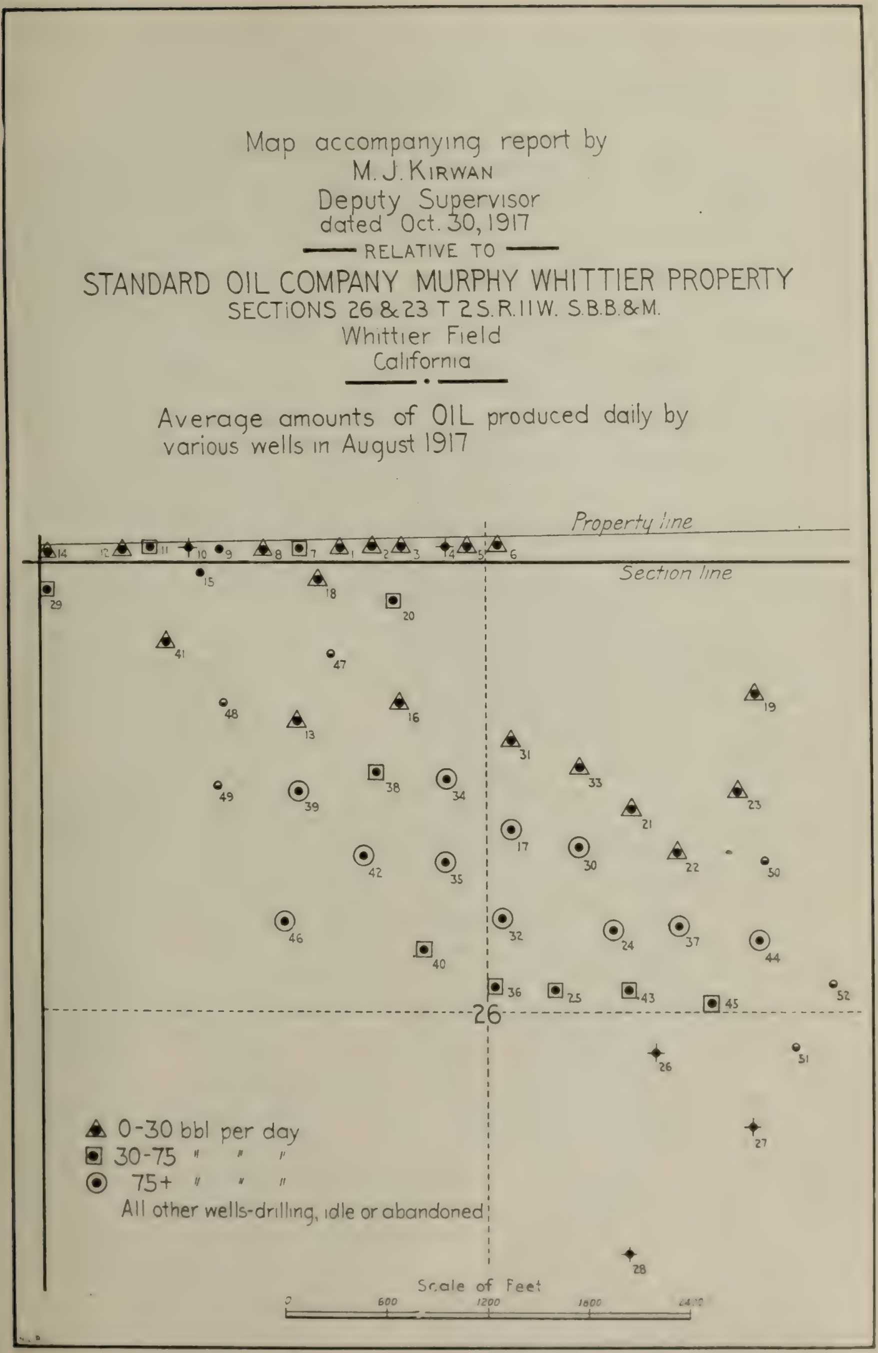

Map accompanying report by
M. J. Kirwan
Deputy Supervisor
dated Oct. 30, 1917
RELATIVE TO
STANDARD OIL COMPANY MURPHY WHITTIER PROPERTY
SECTIONS 26 & 23 T 2 S. R. 11 W. S.B.B.&M.
Whittier Field
California
Average amounts of OIL produced daily by various wells in August 1917
Property line
Section line
14
12
11
10
9
8
7
1
2
3
4
5
6
15
18
29
20
41
47
48
16
13
19
31
33
38
34
39
49
23
21
17
30
42
35
22
50
46
32
24
37
44
40
36
25
43
45
52
26
26
51
27
28
▲ 0-30 bbl per day
▣ 30-75 " " "
◉ 75+ " " "
All other wells-drilling, idle or abandoned
Scale of Feet
0
600
1200
1800
2400

FIG. 11.

Well No.	Total Depth Drilled	FIRST ZONE				SECOND ZONE				THIRD ZONE				AUGUST 1917 Average daily production		% Water	Completed
		Protected	Unprotected	Doubtful	Producing	Protected	Unprotected	Doubtful	Producing	Protected	Unprotected	Doubtful	Producing	Barrels Clean Oil	Barrels Water		
1	1950		X					X				X	X	15	15	50	
2	1940		X					X		X			X	1	0	0	June 1901
3	1950		X					X		X			X	3	0	0	Aug. 1901
4	–													*	*		?
5	1800		X					X				X	X	6	12	66	Dec. 1901
6	2305		X					X		X			X?	4	0	0	
7	2000		X				X				X		X	30	74	71	
8	1950		X				X				X		X	8	45	85	
9	–													*	*		
10	–													*	*		
11	2500		X				X				X		X	48	75	61	
12	2620		X				X				X		X	6	114	95	
13	2800		X				X				X		X	4	96	96	
14	2660		X				X				X		X	20	105	84	
15	2660		X				X				X			*	*		
16	2170		X				X		X		X?		X?	28	96	77	June 1907?
17	2890		X				X		X?		X		X	96	38	28	Sept. 1907
18	2204		X				X					X	X	12	9	43	?
19	2845		X					X		X			X	3	0	0	Apr. 1908
20	2500		X					X	X?		X		X	30	45	60	?
21	2315		X		X?			X	X					13	8	38	Nov. 1907
22	2221			X	X?	X			X					2	5	71	June 6, 1908
23	2075			X		X			X					18	0	0	Oct. 1908
24	2512		X		X?		X		X					96	46	32	July 1909
25	3190		X		X?		X		X		X		X	58	329	85	?
26	5100													*	*		Aug. 1913
27	4275													*	*		
28	2910													*	*		
29	2800		X				X				X		X	42	81	66	
30	2832		X				X		X		X		X	181	27	12	Dec. 1914
31	2972		X				X		X		X		X	28	32	53	Feb. 1915
32	3046		X				X		X		X		X	136	174	56	July 1915
33	2687		X				X		X		X		X	26	45	63	Sept 1915
34	2910		X				X		X		X		X	130	115	47	?
35	2954		X				X		X		X		X	160	180	53	Mar. 1916
36	3228		X				X		X		X		?	51	290	85	Apr. 1916
37	2540		X?		X?		X		X					138	148	52	Apr. 1916
38	2518		X			X			X					65	0	0	Sept. 1916
39	2099		X			X			X					289	0	0	Aug. 1916
40	2035		X?		X									52	25	32.5	Sept. 1916
41	3276		X					X			X		X	16	213	93	Aug. 1917
42	2293			X		X			X					265	0	0	July 1917
43	2097	X			X									68	6	8	Nov. 1916
44	2743			X		X			X					113	0	0	May 1917
45	2202	X			X									44	2	4	Jan. 1917
46	2407			X		X			X					184	0	0	June 1917
47	2645		X					X		X				Not	completed		in Aug.
48	2312			X		X								〃	〃		〃 〃
49	1921			X										Drilling			〃 〃
50														〃			〃 〃
														2489	2450		

* Wells not producing.

FIG. 12.

A zone is considered "doubtful" when a shut off has been made below it without afterwards demonstrating that it has been protected.

A zone is considered "unprotected" when water has not been shut off above and tested, or when a well produces from it and makes considerable water.

The term "intermediate water" is herein used as meaning water between the first and second zones, or second and third zones. The position of "intermediate" water in relation to the zones is given in each case where used.

The term "edge water" is herein used as meaning that water indigenous to the down slope portion of an oil stratum which, as the oil is removed from the stratum, follows up the slope and replaces the oil.

The term "top water" in *all* cases means water above the first zone.

The term "bottom water" is not used in this report, except to quote from company records.

Study of the table shows that there are comparatively few wells in which certain zones are known to be protected and that the majority of them are in the "doubtful" class. Probably a number of "doubtful" zones will have to be placed in the "unprotected" class when the presence of "intermediate" water has been established. Possibly some of the zones in wells in the "unprotected" class produce water which enters through the oils and from neighboring wells.

GEOLOGY.

In general, the structure of this property is a monocline, which is the southward dipping flank of the main Whittier anticline, which is terminated to the north of this property by a fault zone between the Fernando and Puente formations.

It is important to note that the zone of crushing which is in evidence along the fault zone to the north, does not extend into the flanks of the monocline on this property. On the contrary, the structure is a simple monocline, and study of a peg model and cross-sections reveals conformity of underground structure to surface exposures. Three distinct oil zones have been penetrated in drilling on this property. It is worthy to note that zones as reported in log records furnished by the company are fairly uniform. By application of information already obtained these zones may be anticipated at uniform stratigraphic depths in new wells to be drilled in this territory.

The monocline structure is slightly complicated by a flexure, or anticlinal fold in the monocline, the direction of the axis being approximately N. 20° E. and transverse to the strike of the bedding planes of the formations in the center of Section 26, T. 2 S., R. 11 W.

Study of the production reports indicate that this secondary folding introduced into the major structure, probably influences to some extent the disposition of underground storage of oil and water.

On either side of the secondary transverse fold the strike swings toward the direction of the rising axis of the fold.

SUMMARY OF EVIDENCE AT EACH WELL.

Well No. 1.

The log record of this well shows only casing record and depth, and states that light oil was encountered at 1725 ft., being so incomplete that it affords little opportunity to study the possible source of water. (The depth and manner of water shut-off suggests the possible entrance of "top" or "intermediate" water into the various zones.) The depth to which the well was drilled indicates that it penetrated the third zone. Study of the peg model indicates that first zone was encountered at a depth of about 450′ and the second zone at a depth of about 950′. The 5⅝″ casing is perforated below 1400 and possibly tamped above this point in order to shut off water. The perforation record indicates that the well produces oil only from the third zone and possibly water from immediately above this zone.

Old Well No. 1.

The supposed site of the well is now covered by a blacksmith shop and tanks and is located about 50′ south of and between No. 7 and No. 8. Log of this well has not been received. The company probably has no record in their files, as the well was abandoned before the property came into their possession. Probably no protection work for oil sands encountered was done when the well was abandoned.

Well No. 2.

Log record very incomplete, giving only casing record and depths between which one oil sand was encountered. Water was shut off by tamping at a depth of 1400′ and with a packer set at 900′. This well produces no water. A study of the peg model indicates that the first zone was encountered at a depth of about 450′, and the second zone at a depth of about 950′. The log shows rich oil sand from 1800′ to 1940′. The lower portion of the well only is perforated.

The depth of the well indicates that it was drilled into the third zone. This well probably produces only from the third zone, showing that this zone is free from water at this well.

Well No. 3.

The log record gives only depth of well and casing record, and states that light oil was encountered at 1850′. Perforation record is not given on the log. The well averages 3 barrels of oil per day and no water. The well was probably drilled into the upper portions of the third zone. The 5⅝″ (oil string) which was tamped possibly excludes water from the first and second zones. Study of perforation records of adjoining wells suggest that probably only the lower portion of this well was perforated.

Well No. 4.

The only information given on the log is that the well was abandoned by the Murphy Oil Co. The production records of adjoining wells indicate that this well does not allow much, if any, water to enter the formations from which they are producing.

Well No. 5.

The log shows only casing record and depths at which oil was encountered and depth of well. Perforation record is not given. During August the well averaged 6 barrels of oil and 15 barrels of water per day. There is some doubt as to the zones from which the well produces. The well possibly penetrates the third zone.

Well No. 6.

The log gives only casing record and depth to which well was drilled. The depth indicates that the third zone was penetrated.

The production record of this well shows that the formations from which the well produces do not carry water. Since perforation record is not given, there is no evidence at hand to show from which depths the well obtains its production.

Well No. 7.

The log record is very incomplete. The well has been drilled to about the same relative depth as adjoining wells. The first zone probably has been shut off by the tamping process. The production record shows a serious water condition. This may be caused from deterioration of the water string.

Early drillers in the field state that "Old No. 1," not shown on maps, was drilled between No. 7 and No. 8 and abandoned. If this is so, it may account for the water condition of both No. 7 and No. 8. Water may possibly enter this well from Central Oil Company well No. 36-A, about 100′ northwest. The log of Central well shows that the water broke in at 1508′ and was shut off at 1550′. The shut-off point in this well was below the shut-off point in Standard No. 7, and possibly let water into the formation from which the latter well produced. There is no evidence at hand to show how this well, Central No. 36-A, was plugged when abandoned in 1905.

Well No. 8.

Log record very incomplete. No record of water shut-off. Possibly the 7⅝″ casing landed at a depth of 500′ was intended for water string.

This well produces a small amount of oil and considerable water. The source of this water may possibly be abandoned wells No. 9 and No. 10 adjoining, or Central Oil Co. well No. 27-B, located about 100′ northwest. No record has been furnished covering work done in January, 1908, in abandoning Central No. 27-B.

(See remarks under well No. 7, relative to "Old No. 1.")

Well No. 9.

The log filed fails to give any information other than that "the well was abandoned by the Murphy Oil Co." No doubt the Standard Oil Co. would file additional information on this well in case it was available.

Well No. 10.

The log filed fails to give any information except that "the well was abandoned by the Murphy Oil Co."

Well No. 11.

The log record, as shown in the diagram, is not very complete. The 7⅝″ (water string) was landed at 980′ and probably above the first zone. This well probably penetrates first, second and third zones.

The production record shows a serious water condition. There are a number of possible sources of water entering the well as follows: (1) water entering around water string or through possibe deteriorated water string; (2) from well No. 12 adjoining; (3) from abandoned well No. 10 on the east or from wells No. 37-A, 38-A, 39-A of the Central Oil Company which have been abandoned and of which record of work done in abandoning has not been received.

Well No. 12.

The well was drilled to 2610′ and probably plugged up to 2500′. The oil string is perforated from 2300′ to 2500′ and from 2010′ to 2052′. Water was packed off at 1875′.

Study of the peg model indicates that the well was drilled into the third zone and the first zone was shut off.

This well has a bad water condition and produces about 20 barrels of water to one barrel of oil. The records are incomplete and furnish little information as to the probable cause of this condition. The date of plugging the bottom is not given, but well was probably plugged when drilled, indicating that water trouble was present at that time. It is possible that this well makes its own water or that water may enter from sources pointed out under well No. 11, or from Old No. 13, adjoining on the west.

Well No. 13.

The log shows the well was drilled to 2800′ and that apparently large quantities of water were encountered in the bottom.

Study of the peg-model indicates that 9⅝″ casing which was cemented at 1200′, shuts off the upper portion of the first zone. This well has been drilled deeper stratigraphically than any of the adjoining wells, except possibly No. 41.

This well stands practically between well No. 38 and No. 47. Well No. 38 produces clean oil from the second zone and well No. 47 produces clean oil from the third zone. Tests and plugs below second zone in No. 38, demonstrated that water was encountered, establishing that "intermediate" water lies between the second and third zone. This fact may account for some of the water trouble in No. 13. In addition "top" water may not have been shut off and possible "intermediate" water from between the first and second zones may enter the well.

The production of oil obtained from this well is so small and its water condition such as it would seem advisable to either protect the various zones or abandon the well.

Old Well No. 13.

Old maps show "Old 13" as having been drilled on the north line, between No. 12 and No. 14. A letter from the company dated September 13, 1917, states that they have no record of this well having been drilled. A former workman in the Whittier field stated that this well produced a large quantity of water and a small amount of oil when pumped. Surface evidence indicates that a well was drilled at this location. Possibly the well was not plugged when abandoned and may be the source of some of the water produced by wells No. 12, 14 and 29.

Well No. 14.

This well probably penetrates the three oil zones. The log record does not show the depth at which water was shut off. Possibly the 7⅝″ casing landed at 1900′ was intended for a water-string, or the 5⅝″ oil string may have been tamped.

Perforation records are not given and there is no definite evidence to show which portions of the well produce. The water condition is serious, possibly due to a combination of causes such as "intermediate" water or "top" water, or entrance of water from neighboring wells.

Well No. 15.

The log shows that an oil sand was penetrated between depths of 2220′ and 2250′ and that the well was drilled to 2660′.

According to monthly production reports, the well has been shut down since July, 1916, during which month it produced 4 days, making an average of 8 barrels of clean oil per day and 95 per cent water.

Study of the peg model indicates that the first and second zones were shut off and the oil sand from 2000′ to 2250′ is possibly a part of the third zone. The 5⅝″ casing was probably tamped in order to shut off water. This casing apparently was landed below the top of the third zone.

The well in its present condition may be admitting water to zones which are productive in neighboring wells. It would seem advisable to test the well to determine its condition and plug it in order to save the territory.

Well No. 16.

The log of this well shows that water was shut off at a depth of 1610′. Study of records of adjoining wells and peg model indicate that this shut-off is below the first zone. There is no data at hand to show the method used in shutting off water.

The first zone is probably not protected from water. The record of this well shows that it produced 80 barrels of oil and 100 barrels of water on June 16, 1907. This record suggests the probability of a water bearing formation having been penetrated below the second oil zone. The depth of the well indicates that it entered the top of the third zone or ''intermediate'' water below the second zone which was encountered and plugged off in adjoining well No. 38.

Old Well No. 16.

Old maps and surface indications show that a well was drilled east of No. 15. A letter from the company states that they have no record showing this well was drilled. It would seem advisable to make further search for information relative to depth and work in abandoning.

Well No. 17.

This well was drilled to 2890′. Five and five-eighths inch casing landed at 2740′. The 5⅝″ has only a few holes punched in it. The 4½″ liner was well perforated. Water shut off at 2060′.

Study of peg model indicates that shut-off point in this well is below the first zone and that the well penetrated the third zone. The date of completion suggests that the ''tamping'' method was used to shut off water. Water which enters this well may come through the third zone. Study of adjoining well records indicate the possibility of entrance of water through the perforation in the 5⅝″ casing and that the source of the water probably is above the third zone.

Old Well No. 17.

Old maps and surface indications show that this well was drilled east of ''Old'' No. 16 and west of No. 18.

The company stated that they have no evidence of this well as having been drilled. Perhaps it would be well for them to try and secure some information relative to existence, depth, work in abandoning, from former employees on the property, providing they are in the district.

Well No. 18.

Study of peg model indicates that the 5⅝″ casing was landed immediately above the top of the third zone and that this zone was penetrated by the well. The first and second zones were shut off. The production of the well amounts to nearly one-half water. However, the amount of water being relatively small does not indicate a serious water condition. Record of perforation is not given in the log. The production is probably obtained from the third zone.

Well No. 19.

Study of records at hand indicates that the oil sand encountered from 1300′ to 1350′ is a part of the second zone, and that the showing of oil encountered at 2497′ is possibly a part of the third zone. The second zone was probably shut off with the 7⅝″ casing and probably not protected. The greater portion of the second zone is probably behind the 5⅝″ casing and also probably unprotected.

The log shows that water was encountered at the bottom. Record of depth and manner of water shut-off is not given. Possibly water was tamped off around the 5⅝″ casing, beginning at the top of the perforations. The lower 400′ of the oil string is perforated. The production record shows that the well averaged only 3 barrels of oil per day and no water, during August, 1917. The records do not show whether water encountered at the bottom of the well was plugged off or exhausted.

Old Well No. 19.

The well is located between No. 18 and No. 20. A letter from the company states that they have no log or history and that they believe the well is very shallow.

Well No. 20.

The log of this well shows only casing record and depth of well. Study of the peg model indicates that the first zone was encountered at a depth of about 700′ and the second zone at about 1200′ and the top of the third zone at about 1900′. The first zone and upper part of the second zone were probably shut off with the 9⅝″ casing. The well probably produces from the third zone and a part of the second. The depth and manner in which the well was cased suggest the possible entrance of "intermediate" water from between the second and third zones or water from above these zones.

The absence of formation record would make it difficult to suggest remedial work or for the company to correct the trouble without considerable expense in plugging and testing. No doubt records similar to the one kept at this well are largely responsible for the former owners doing especially poor work in the matter of handling the water problem in the wells which they drilled.

Well No. 21.

Study of the peg model indicates that the first zone was encountered at a depth of about 1350′. The shut-off point in this well is below the first zone and probably immediately above the second zone. The well probably produces from the second zone only. As shown on the accompanying diagram, the log is very incomplete. The typewritten copy of the log does not definitely show the depth to which the well was drilled, or give a record of the perforations. The well produces only a small amount of oil and water.

Well No. 22.

The log shows that this well was drilled to 2221′, and gives no casing record below a depth of 1540′, at which depth 5⅝″ casing was landed.

Study of the peg model indicates that the first zone was encountered at a depth of about 1450′. The log does not give a record of formations penetrated above a depth of 1800′. The well averages 2 barrels of oil and 5 barrels of water per day. This production is probably obtained from the second zone. More complete casing record is very desirable, for, if the formations below the bottom of the 5⅝″ casing (landed at 1540′) are not shut off, it would indicate that the formations between the first and second zones do not carry water at this well.

Well No. 23.

Study of the peg model indicates that the first zone was penetrated at a depth of about 1400′ and that the well was not drilled below the second zone.

The log record shows that the well was sand-tamped for nearly 300′ above perforation. Tamping was probably started at a depth of 1645′, shutting off water below the first zone. The production record shows that the second zone is free from water at this well.

Well No. 24.

Drilling was commenced July, 1908, and completed July, 1909. Tamping to shut off water was started at 2090′. Several tons of sand was tamped behind the 5⅝″ casing. This operation shut off the first zone probably without protection. The well probably produces from the second zone.

Study of log record and production reports give little evidence regarding the probable source of water entering the well. The method used in shutting off water suggests the possibility that all water was not effectually excluded. The log does not give a record of the formations penetrated above a depth of 2100′. Study of the peg model shows that the first zone was probably encountered at a depth of about 1625′.

The top of the second zone probably begins at 2100′, where "oil" is reported.

The depth of the well suggests the possibility of entrance of water from near the bottom. This water would correspond to "intermediate" water between the second and third zone. There is no data at hand to show the exact depth at which water was encountered below the second zone, in other wells, and by which the depth to possible "intermediate" water may be compared.

Well No. 25.

Study of the log record and peg model indicates that the first zone was penetrated at 1767′. Nine and five-eighths inch casing was cemented with 10 tons of cement above the first zone. The log does not state if an effective shut-off was made. The well penetrates and probably produces from the three zones. This well produces about 6 barrels of water to one barrel of oil. The water condition is serious and work to remedy this condition should be started in the near future. Probable "intermediate" water between the second and third zones may be the cause of most of the trouble. It would seem advisable to locate the source of the water by plugging between these zones in order that each of them may be properly protected.

Well No. 26.

This well was drilled to a depth of 5100′, penetrating and logging the three oil zones.

The well was plugged at a critical place (from 2892′ to 2462′) with pipe cutting and gravel on inside of the 7⅝″ casing. Plugging in this manner and with material used could not reasonably be expected to protect oil bearing formation between these depths. The cement plug from 2462′ to 2412′ probably prevents the passage of water on the *inside* of the 7⅝″ casing between these depths. Gravel from 2412′ to 2388′ was probably used to merely fill up this space. Plugging done with pipe cuttings and gravel from 2345′ to 2310′ probably is of no particular value as *oil sand* is recorded between these depths. The log shows oil sand where the next cement plug was put in, except upper 10′ of the plug is in sandy shale, providing the plug is not inside of the casing.

Particular attention is hereby called to the manner of plugging wells on the inside of casing, even though in some cases it may be perforated, in which passage of water may not be prevented along the outside of the casing.

Work at this well was completed by Standard Oil Company May 2, 1914.

The log, or history, does not give a record of the shooting done in loosening the upper portion of 7⅝″ and 9⅝″ casings. Recent developments in adjoining wells No. 43 and 45 show conclusively that the first zone is productive and free from water at these wells. The history of well No. 26 shows that the various oil zones were probably not adequately protected from water when abandoned and water may possibly enter the various oil zones penetrated by this well.

Well No. 27.

This well was drilled to 4275′ and abandoned by the Murphy Oil Co. Sands carrying oil are reported in the log. These sands may represent the first zone penetrated by other wells on the property. Record of work done in abandoning has not been furnished. Probably this information was not available to the Standard Oil Company at the time they purchased the property. This well is about 700′ distant from other wells, and in line of present development. Future developments may show that water is entering oil sands at this well.

Well No. 28.

The log states that this well was drilled by the Murphy Oil Company and was being abandoned at the time the property was taken over by the Standard Oil Company. Abandonment work was completed in April, 1914, by the present owners. The reason given for abandonment is that it was a "dry" hole.

The well was probably drilled deep enough to encounter formations corresponding to the first zone. There are no means at this time for determining whether possible productive formations were encountered. Future development of the territory may furnish this information.

Well No. 29.

Study of the peg model indicates that this well was drilled into the third zone. The log shows that 8¼″ casing was cemented at 2389′, above "dark, sandy shale, showing a little oil." Although the log gives a record of the formations passed through, there is not much evidence to definitely show the depth at which the various zones were encountered. The well is located in the northwest corner of Section 26, and logs of adjoining wells give but little information for the establishment of correlation with formations penetrated by them.

The log does not show what tests, if any, were made to determine the effectiveness of the shut off with 8¼″ casing. There is no information at hand to show that oil bearing formations above the shut off point, and from which adjoining wells may be producing, are protected from water. Possibly water from "Old" No. 13 may enter this well.

Well No. 30.

This well was completed in December, 1914.

Study of the peg model and cross sections shows that the first zone was encountered at 1500′. This zone was shut off with 10″ casing cemented at 2021′ with 7 tons of cement. No definite evidence to show that this zone has been protected is given in records received from the company.

The log gives no data relative to tests made to determine the effectiveness of water shut off with the 10″ casing.

The well produces from the second and third zones. This well averaged 27 barrels of water per day during August. This amount is less than produced by the average well penetrating and producing from more than one zone. The following production record is taken from the monthly production reports received by the department from the company:

Month	Barrels oil	Per cent water
1916—January	8,125	12
February	5,743	12
March	4,909	12
April	5,684	12
May	7,626	12
June	7,290	12
July	7,093	5
August	6,975	4.7
September	6,480	5
October	6,975	49.5
November	6,750	9.7
December	7,006	9.8
1917—January	6,240	14.4
February	5,092	23.2
March	5,779	19.9
April	5,619	18.6
May	5,813	18
June	5,535	16
July	5,748	13
August	5,667	13

The log shows that the oil string has been perforated opposite all of the sands reported below the top of the first zone.

The water produced possibly comes from sands between the second and third zones.

Well No. 31.

This well was completed February 5, 1915.

There is no evidence at hand to show that the first zone has been protected from water. The shut-off point in the well is below the first zone and above the second zone. The well was drilled into the third zone. Assuming that the shut-off is effective (cemented with 7 tons) then the water which is produced probably enters the well through the second or third zones, or from between these zones

Well No. 32.

The shut-off point is below the first zone. The well was drilled into the third zone. Records from the company show that the well was plugged with cement and lathe turnings from 3046′ to 2970′ and failed to shut off water. Test of water shut-off witnessed by this department on September 13th, 1915, showed that water was not shut off and the following recommendation was made:

> "This well may be pumped for 30 days from date to demonstrate if water is shut off. At the option of the company, during this time, a new plug may be put in or the water string tested."

Additional plugging has not been done to date.

The log shows that 8¼″ casing landed at 2957′ above the point to which the well was plugged. Evidently plugging was done in the *formation* below the casing. The records do not show if any sidetracked casing was left in the well below a depth of 2957′ which might act as a conductor of water. The well was plugged at the bottom in sand. The 10″ casing which was cemented with 10 tons of cement probably prevents the downward passage of water below a depth of 2139′.

Probable "intermediate" water from between the second and third zone may be entering this well.

Well No. 33.

Study of the peg model and log record indicates that the 12½″ casing was cemented below the first zone. The log gives no record as to the effectiveness of the shut off with the casing.

The 10″ casing was cemented above the second zone. Records filed do not show manner or result of test of water shut off. The well was drilled into the third zone and produces from both second and third zones and averages nearly two barrels of water to one barrel of oil. Probable "intermediate" water between the second and third zones may be entering the well.

Well No. 34.

The shut-off point is below the first zone and above the second zone. Record of results of test of shut off are not shown on the log. The well averaged 130 barrels of oil and 115 barrels of water per day during August. The source of water in this well probably is the same as other "third zone" wells in the vicinity, "intermediate" water or possibly water entering the well through the second or third zone.

Well No. 35.

Drilling was commenced August 24, 1915.

The first zone was shut off, the shut-off point being above the second zone. The test of shut off with 10″ casing was witnessed and approved by a member of this department.

The well was drilled into the third zone and completed March 22, 1916; however, the March production report shows it producing 31 days during this month. It is important that the production of oil and *water* be recorded immediately after the completion of a well. The production report showed the amount of oil produced but *not* the amount or percentage of water until June, 1916, when the report showed the well making 2.4 per cent water and, the month following, as making 45 per cent water. At the request of this department, the company checked the June production with their field records and found that the well averaged 254 barrels of oil and 180 barrels of water per day, during June, 1916.

Probably the 10″ casing is still preventing the passage of water below the cementing point (2208′), indicating that the source is from the second or third zone or "intermediate" water from between them.

During August, 1917, this well produced considerably more water than oil.

Well No. 36.

Drilling was commenced October 18, 1915; 12½″ casing cemented at 1720′, above the first zone, but failed to shut off water. Notice of test of water shut-off was not filed and test was not witnessed by this department. Drilling was continued and 10″ casing cemented at a depth of 2351′, *below* the first zone. The first test made by the company after cementing, showed that water was not shut off. The 10″ casing was re-cemented with tubing by pumping in 1½ tons of cement. Test of water shut-off witnessed by a member of the department showed that water was not passing to lower levels in the well. The well was drilled into the third zone. The log record states that "bottom" water was encountered somewhere between depths of 2351′ (water shut-off point) and 3228′ (bottom of well). The well was pumped from April 15 to May 7, 1916, and according to the record made a large amount of water with a slight showing of oil. Production of this well was not shown on production reports until June, 1916. Following is the record given. The barrels of water was computed by this department from data on the report.

Month	Bbl. of clean oil	Bbl. of water	Per cent water	Number of days produced	Remarks
1916—June	618			13	
July					Shutting off water.
August	1,080	9,720	90	20	
September	1,378	12,402	90	30	
October					Well not shown.
November					Well not shown.
December	980	1,728	64	9	Production report shows well producing 31 days.
1917—January					Not shown.
February					Shutting off water.
March					Shutting off water.
April	830	2,943	78	12	
May	2,085	3,707	64	31	
June	1,637	7,401	82	28	
July	1,524	6,497	81	29	
August	1,532	8,681	85	30	
Totals	11,664	53,079			

The various plugging and testing operations which were carried on at this well from April, 1916, to April, 1917, showed that water was entering the well somewhere below shoe of the 10″ casing. The matter of plugging and testing was not taken up with this department. At present the well produces about six times as much water as oil and possibly allows a large quantity of water to enter both the second and third oil zones.

In view of the amount of work done at this well and its serious water condition, it would seem advisable to clean out or redrill, if necessary, to a depth of about 3110′; shoot and plug with cement in the *formation* between the following depths: 3090′ and 3110′; 2995′ and 3015′; 2880′ and 2900′; 2650′ and 2670′. Each cement plug put in should be allowed to stand at least 24 hours and a determination made that cement has set properly before doing further work. The space between the cement plugs should be filled with clay or cement. Test should be made, pumping preferably, after each cement plug has been put in. While the record shows that *all* casing above a depth of 2529′ has been withdrawn from the well, it would seem advisable to shoot between depths indicated above in order to shoot together one or more open holes that possibly have been sidetracked during the various plugging, replugging and redrilling operations.

The failure to shut off water in this well after a year's work should be sufficient evidence to prove that it is not advisable to drill wells *below* the second zone until such time as the water situation can be effectively handled.

Well No. 37.

Study of the peg model indicates that the horizon of the first zone may begin at 1600′, where sandy shale showing oil was encountered, or with the "sandy shale showing oil" encountered at a depth of 1816′. This latter shale is reported as 33′ in thickness and has been shut off with 10″ casing cemented at 1874′. Test of water shut-off witnessed by this department shows the balance of the first zone was protected from "top" water. The well was drilled into the second zone.

Following is a record of the early production of the well. The number of barrels of water shown was computed by this department.

Month	Bbl. of clean oil	Bbl. of water	Per cent water	Number of days produced
1916 April	2,205	490	18.4	7
May	9,083	2,170	19.3	31
June	9,180	4,440	32.8	30
July	9,637	4,465	31.6	31
August	9.300	5,700	38.0	31
September	7,488	4,589	38.0	30
October	8,335	5,109	38.0	31
November	7,440	6,463	46.5	30
December	6,975	6,062	46.5	31
1917—January	5,769	7,024	54.9	30
February	4,643	5,450	54.0	24
March	6,114	7,323	54.5	29
April	4.965	6,717	57.5	30
May	4,499	6,474	59.0	31
June	4,407	6.341	59.0	30
July	4,128	4,845	54.0	30
August	4,226	4,580	52.0	31
Totals	108.415	88,226		

The production record for April, May and June, 1916, was taken from a report from the company and not from monthly production reports, which apparently have typographical errors as to the number of days produced and percentage of water.

There is apparently a typographical error in the log, which shows the well completed, *September*, 1916, as production report is shown for April of same year.

The $8\frac{1}{4}''$ casing (oil string) is landed about the center of the second zone and is *not* perforated. The present $6\frac{1}{4}''$ oil string is perforated through the second zone only.

It would seem advisable at this time to make an effort to locate the source of water entering the well and carry out necessary remedial work in order to protect both the first and second zone from water. Study of production of wells in the neighborhood show that clean oil may be produced from either the first or the second zone, individually, as follows: first zone, Wells No. 43, No. 45; second zone, No. 44.

Study of the record of this well indicates that the source of water is local and probably is "intermediate" water from between the first and second zones or possibly from below the second zone.

Well No. 38.

Drilling was commenced December 21, 1915. The company proposed to shut off water at a depth of about 2050′, estimating that producing oil sand should be encountered at 2100′. This proposal received the approval of this department.

The first zone was encountered at a depth of 1420′. No provision was made by the company to protect this zone; 12½″ casing was carried through it and "landed" at a depth of 1617′. Water was shut off in the well immediately above the top of the second zone and test approved by this department. The well was drilled 540′ below the top of the second zone, entering water-bearing formations and possibly the top of the third zone. After drilling was completed, the well produced at the rate of 500 barrels of *water* per day. The record indicates that the oil string was withdrawn and the bottom of the well plugged up to 2070′ with cement, brick, rope and gravel.

The work at this well definitely showed two things: (1) that water-bearing formations are present below the second zone; (2) that the second zone does *not* carry water at this well. The records do not show whether or not the hole was plugged from 2518′ to 2070′ in one operation. This leaves the question of exact depth of source of water undecided except that it is between limits of 2518′ and 2070′.

Well No. 39.

Drilling was commenced February 22, 1916. It is interesting to note at this time that the company estimated in their notice of intention to commence drilling, that water should be shut off at a depth of *2100′*, and that approval was given by this department to shut off at this depth, also that the well was completed at a depth of *2099′*.

No provision was made by the company to protect the first zone from water as 12½″ casing was "landed" below this zone. Water was shut off immediately above the second zone and well was completed July 21, 1916, making an average of 330 barrels of clean oil per day and *no* water, proving that the the second zone is very productive and free from water. The present daily average of this well is 289 barrels of clean oil and *no* water.

Well No. 40.

Drilling was commenced April 22, 1916. The company estimated that productive oil sand would be encountered at a depth of 3000′ and proposed to shut off water at a depth of 2200′, or 800′ above where oil sand was expected. The log shows that the well was completed at a depth of *2035′*, or nearly 1000′ above where it was estimated the *top* of oil sand should be encountered.

Estimates of this kind are confusing and are of no value to this department. The company was advised that the local representative of the department could not be present at the test and requested them to test the well themselves and file written report. This was done and test approved in our decision No. C–89, dated September 27, 1916.

The well was completed August 29, 1916. Production report for September, 1916, shows that the well was "brought in" making a daily average of 193 barrels of clean oil and 28 per cent water during 17 days in this month.

This well has been drilled into the first zone only. The production shows that the first zone is capable of producing a sufficient amount of oil to warrant definite protection from water in this and other wells penetrating this zone. Study of the production record indicates that water may not be completely shut off or that the first zone carries water at this location. This water may possibly enter the well from adjoining wells, numbers 25, 32, 35 and 36, all of which are "third zone" wells, completed and producing large amounts of water at the time this well made its initial production.

The log shows gravel from 1960′ to 1995′ and shale from 1995′ to 2035′. The water condition of the well may possibly be improved by plugging from 2035′ up to about 1950′.

Following is production taken from monthly reports. The data under "Barrels of water" were computed by this department.

Month	Bbls. of clean oil	Bbls. of water	Water, per cent	Number of days produced
1916—September	3,281	1,275	28.0	17
October	2,147	835	28.0	31
November	2,331	1,489	39.0	30
December	2,227	475	17.6	31
1917—January	2,116	1,380	39.5	23
February	3,416	1,569	31.5	28
March	1,455	1,235	38.3	22
April	3,871	955	19.4	30
May	3,716	815	18.0	29
June	2,962	740	20.0	28
July	1,592	715	31.0	20
August	1,047	492	32.0	20
Totals	30,631	11,975		

Well No. 41.

Notice of intention to commence drilling was received April 20, 1916.

This well is located near the northwest corner of Section 26, and there is some doubt as to the exact depths at which the various zones were encountered. Study of the peg model indicates that the first zone was encountered at a depth of 1145′; at which depth first oil-bearing formations are recorded in the log.

Ten-inch casing was cemented at 1916′, or 16′ below the top of the *oil sand* encountered at a depth of 1900′. The results of test of water shut-off showed that water was prevented from descending to lower level in the well. The shut-off point was below the first zone and probably into the second zone. Records from the company state that the well was drilled to 2103′ and 8¼″ perforated casing set at 2087′, and well pumped 3 days, exhausting drilling water and oil. The 8¼″

casing was carried to 2851′. Bailing tests showed that the well was making water. At this depth, cement was pumped through the perforations of the 8¼″ casing; failing, however, to shut off this water. The 6¼″ was put in and the well deepened to 3048′. Hole was bridged back to 2882′, at which depth the 6¼″ casing was cemented, but failed to shut off water. With the well in this condition, the company proposed to put in the 4½″ casing, make pumping test and deepen. Approval was given *only* to clean out to 3048′ and test by pumping. (See our Decision No. CC–282 of May 26, 1917.) This decision states that further recommendations would be made after the well had been tested by pumping. In answer to a request for information, the following letter, dated October 24, 1917, was received from the company:

> "In reply to work done in M–W Well No. 41, since your Decision No. CC–282 of May 26, 1917:
>
> On same date Decision CC–282 was sent to company, production was discontinued. Tubing and rods were pulled out the day following and cleaning out, underreaming and drilling operations followed throughout balance of May, all of June and July and part of August. Hole was deepened from 3048 to 3276 ft. and the well was finished up with 4¼″ casing, landed at 3258 ft. Started putting in the 4¼″ May 29th, and landed same August 4th. The 6¼″ casing was not disturbed. Put well to pumping August 6th. Made water 6th and 7th. From 8th to 12th, 'Pumping water, shows a little oil.' August 13th, 'Water, shows a little more oil.' Since August 13th, has been reported in production column regularly. The August production report shows 93 per cent water. September 94 per cent water.
>
> Will have log in duplicate on regular form at early date."

The well produced 16 days during August, 1917, and made a daily average production of 16 barrels of clean oil and 214 barrels of water.

The outstanding feature of work at this well is that the first zone was shut off and probably not protected from water. The second zone protected from water above it. The test of 3 days was not sufficient to adequately demonstrate the productiveness of this zone. However, it did show that the second zone does not carry water at this well. Study of peg model and log records indicates that the top of the third zone probably begins at a depth of 2500′ and that the upper portion of this zone has been shut off with 6¼″ casing cemented at 2882′.

The company did not submit a proposal or receive approval of this department to cement perforated 8¼″ casing at a depth of 2851′, below the second zone. Notice of test of water shut-off was not received. The results of tests made by the company showed that this casing failed to shut off water. Study of the results of this test indicates that "intermediate" water was encountered between the second and third zones.

or that possibly the upper portion of the third zone carries water. A proposal was not received to cement the 6¼″ casing at 2882′, nor notice of test of water shut off when the cement job was tested.

The letter of October 24 from the company, quoted above, shows that our decision No. CC-282 was ignored and the well deepened from 2048′ to 3276′ with water not shut off. Work of this kind only serves to complicate matters.

Recent developments at adjoining Well No. 47, which produces clean oil from the third zone, show the necessity of tests to determine the source of water entering the well, and that repair work is necessary to protect the various zones from water.

Well No. 42.

Notice of intention to commence drilling was received April 20, 1916. The company estimated that productive oil sand should be encountered at a depth of about 2900′. Water was shut off with 10″ casing at 1587′ and the top of the first zone encountered at 1600′. The well was drilled 100′ into the first zone and produced with the following results, according to the monthly production reports:

Year and month	Barrels of clean oil	Percentage of water	Gravity	Number of days produced
1916—November	756	Not given	13.4	12
December	425	------------	Not given	25
1917—January	396	------------	12.5	9
February	135	Not given	12.3	3
March	642	Not given	13.5	20

On May 1, 1917, this department approved proposal from company to deepen and cement 8¼″ casing below the first zone and above the second zone. The company stated that this casing would be cemented to prevent water that might be encountered from entering either the upper (first zone) or lower sand (second zone), and to keep heavy oil out of second zone. Accordingly 8¼″ was cemented at 2111′. After receiving approval of test of water shut off, the well was drilled to a depth of 2293′ and the well completed in the second zone.

The results obtained show that first zone was free from water at this well and yielded an average production of 34 barrels of oil per day for days which the well was pumped, although it appears to have been difficult to operate the well on account of sand trouble. Probably the well would have produced more oil if the first zone was penetrated to a greater depth, as the deepening record showed that oil sand continued for 34 feet below the depth at which the well was tested. Records of this department do not show that tests were made to establish the presence or absence of water bearing formations between the first and second zones. At present the well produces an average of 265 barrels of oil per day and *no* water from the second zone.

Well No. 43.

Drilling was commenced August 17, 1916, and completed November 17, same year. This well penetrates and produces from the first zone *only*.

Production record is as follows:

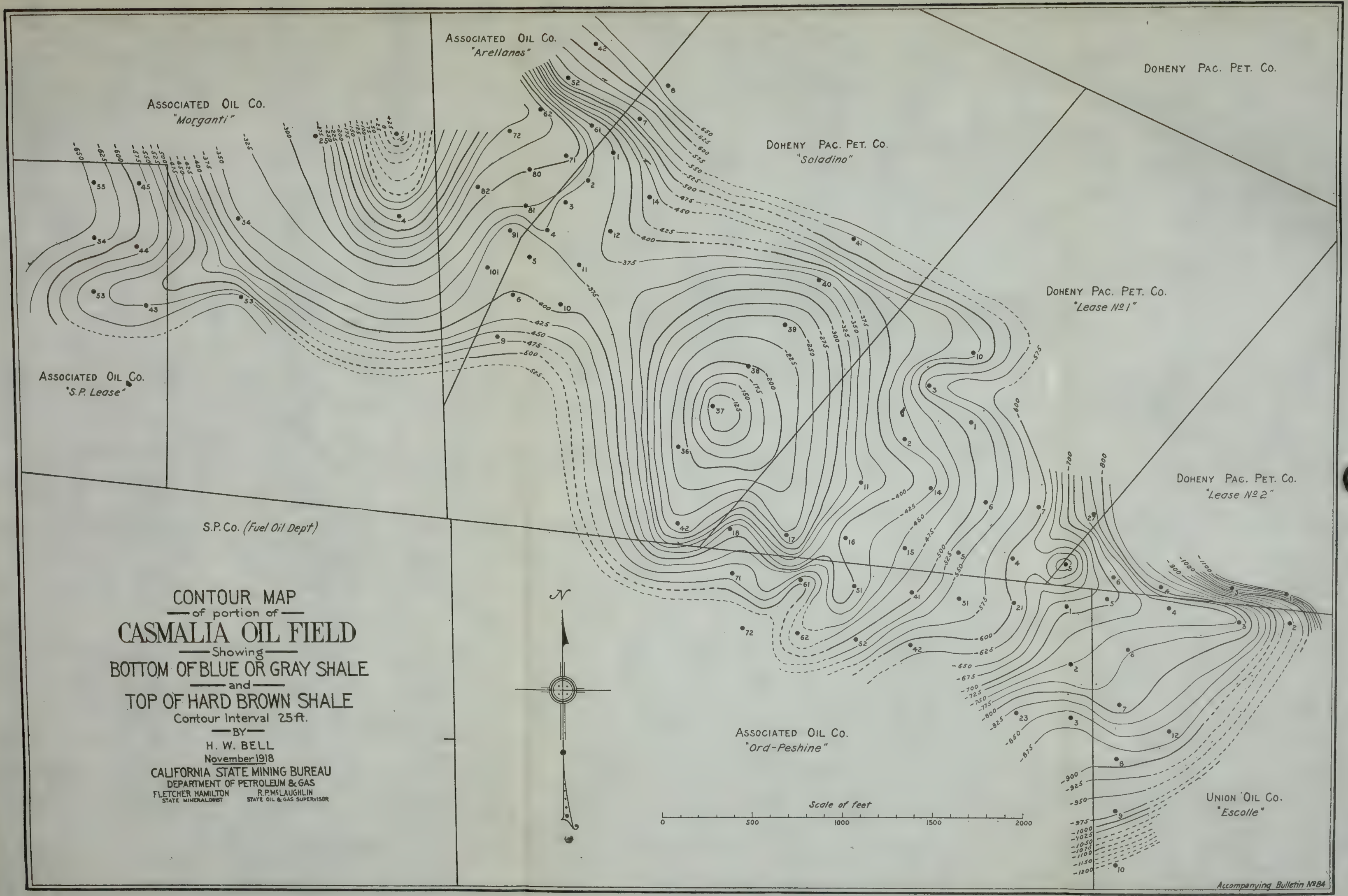
Year and month	Barrels of clean oil	Percentage of water	Gravity	Number of days produced
1916—November	612	Not given	13.0	4
December	6,397	22.8	14.9	31
1917—January	5,549	7.7	14.9	31
February	3,947	Not given	14.9	28
March	3,366	12.4	11.4	28
April	2,850	12.8	11.1	28
May	2,724	14.0	11.0	31
June	2,298	8.3	12.0	30
July	3,309	7.9	13.0	31
August	2,110	8.0	11.0	31
Total	32,162			

There is an error in the monthly production reports for this well as follows: the percentage for June is shown as 83. The percentage for July is shown as 79, and should be 7.9. This has been confirmed by a letter from the company.

The production of oil obtained from the first zone at this well is sufficient to warrant its protection from water in future wells drilled on the property.

Well No. 44.

Notice of intention to commence drilling was received June 6, 1916. Approved proposed depth of water shut-off. ''Brown shale showing oil'' was penetrated between depths of 1885′ and 1905′. Study of the peg model indicates that the first zone was probably encountered at a depth of 2045′; however, there is some question as to whether or not the top ''Brown shale showing a little oil'' should not be taken as the top of this zone. Ten inch casing was cemented at 2042′ and the well drilled 38′ ahead of the shoe of this casing and apparently bailed dry. Test of water shut-off witnessed December 12, 1916, showed 250′ of fluid in the hole, mostly water. Formation had filled 6′ up into the water string when this test was witnessed. Recommended cleaning out and that further bailing tests be made. A report from the company, dated December 20, states that subsequent bailing tests were made and concluded by allowing the well to stand 24 hours, when two bailers of oil and no water came in. However, the well had *filled up* 220′ with



CONTOUR MAP
of portion of
CASMALIA OIL FIELD
Showing
BOTTOM OF BLUE OR GRAY SHALE
and
TOP OF HARD BROWN SHALE
Contour Interval 25 ft.
BY
H. W. BELL
November 1918
CALIFORNIA STATE MINING BUREAU
DEPARTMENT OF PETROLEUM & GAS
FLETCHER HAMILTON, STATE MINERALOGIST
R. P. McLAUGHLIN, STATE OIL & GAS SUPERVISOR

Associated Oil Co. "Arellanes"
Associated Oil Co. "Morganti"
Doheny Pac. Pet. Co.
Doheny Pac. Pet. Co. "Soladino"
Doheny Pac. Pet. Co. "Lease Nº 1"
Doheny Pac. Pet. Co. "Lease Nº 2"
Associated Oil Co. "S.P. Lease"
S.P. Co. (Fuel Oil Dep't)
Associated Oil Co. "Ord-Peshine"
Union Oil Co. "Escolle"
N
Scale of feet
0
500
1000
1500
2000
Accompanying Bulletin Nº 84

FIG. 13.

mud and sand when this test was made. In this condition the well stood bailed dry for an additional 48 hours.

Test of water shut-off was approved after this test had been completed. The well was then deepened to 2701′ (into the second zone) and pumped from January 6 to February 15, 1917, averaging about 10 barrels of oil per day. During this time trouble was experienced with heaving sand and considerable water had to be run in when cleaning out. The water condition of the well was not definitely determined, although the production reports show that the well averaged about 50 per cent water while pumping.

The well was bridged from 2620′ to 2560′ and 8¼″ casing cemented at the latter depth. Test of water shut-off was witnessed on April 9, 1916, and the following decision rendered:

> "Data at hand indicates that the 8¼″ casing which was cemented at a depth of 2560′ shuts off formations which are productive in adjoining wells, and damage from water may be ensuing. This casing was cemented without the approval or knowledge of this department. The test indicates that possible water above a depth of 2560′ is prevented from passing to lower levels in the well. I recommend that the company test the well by pumping or bailing above a depth of 2701′, pending further recommendations."

The well was deepened from 2701′ to 2743′ and at present is producing from the second zone. During August of this year the well averaged 113 barrels of oil per day and *no water,* showing that the second zone is free from water and that water evidently was present between the first and second zones.

Work at this well demonstrated the failure to produce clean oil from both the first and second zones simultaneously.

Well No. 45.

Drilling was started October 13, 1916, and the well completed January 24, 1917. This department approved proposed estimated depth for shutting off water. Water was shut off above the first zone. The well was drilled into the first zone *only,* and during August, 1917, averaged 44 barrels of oil and 2 barrels of water, daily.

Probably all of the first zone has not been penetrated by the well and the production may possibly be increased by deepening. In case the company decides to deepen, it would be well to do so in stages of about 50′, in order to locate possible "intermediate" water below the first zone and above the second zone. The production obtained demonstrates that the portion of the first zone entered is practically free from water at this well.

Well No. 46.

Drilling was started December 21, 1916.

The company proposed to shut off water at a depth of about 1600′, and estimated that productive oil sand should be encountered at a depth of about 1700′. This department recommended that company shut off water at about 2000′. The following letter, dated January 3, 1917, was received from the company in reply to this decision:

> "Kindly refer to your letter to me under date of December 27th, and your report on proposed operations, dated December 29th, No. CC-183, both relative to the drilling of M-W No. 46.
>
> You state that you think it advisable to shut off water at 2000 feet. We know there is a heavy oil sand above this point at about 1700 ft. and therefore would recommend shutting the water off at about 1600 ft., as stated in our notice of December 13th. We would endeavor to shut this water off with the 10″ casing and test out the heavy oil sand at 1700 feet. If we were unsuccessful in shutting off the water, and the quantity of oil obtained was not sufficient to warrant us continuing producing from this sand, we would shut off the water at 2000 ft. with 8¼″ casing and complete the well in the lower sand with 6¼″ casing.
>
> Kindly advise me as soon as possible, your recommendations in this matter."

This department replied on January 8, 1917, as follows:

> "Yours of January 3d relative to Murphy-Whittier No. 46 to hand. Note what you have to say about heavy oil at 1700 ft. If you think this is worth testing out, it will be all right to shut off water at about 1600 ft. and make the test, but I think it is very bad policy to change your shut-off point back to a higher level, and would not recommend your drilling into the lower sand until you have shut off with the 8¼″ at about 2000 ft. It is my belief that the present bad condition of this property is largely due to the hit-and-miss policy which was formerly followed in this regard."

Twelve and one-half inch casing was cemented at 1534′ but failed to shut off water. This department was not notified to witness this test. Study of the peg model indicates that the first zone was encountered at a depth of 1556′ and continued to a depth of 1836′. Ten inch casing was cemented at a depth of 2227′, with 13½ tons of cement on May 28, 1917, and test of shut-off showed that water was not passing to lower levels in the well. The second zone was encountered at a depth of 2212′.

Study of records filed by the company indicates that the first zone was not tested to determine its productiveness. Possibly this was due to the fact that water above this zone was not effectively shut off. The attention of the company was called to the unprotected condition of the first zone. The theory was advanced by the company that cement behind the 10″ casing reached up to the bottom of the 12½″ casing and protected the first zone from water. The correctness of this theory, however, was not demonstrated and damage to the first zone may be ensuing. Adjoining Well No. 40 was averaging 120 barrels of oil per day *from the first zone*, at the time the first zone was shut off in Well No. 46.

Following is production record of Well No. 46, taken from monthly production reports furnished by the company.

Year and month	Barrels of clean oil	Bbls. of water	Per cent of water	Number of days produced
1917 June	381	------	------	3
July	6,490	------	------	31
August	5,770	------	------	31
Total	12,641			

The production of clean oil from the second zone at this well means considerable to the company in the matter of extending the proved area on the property.

Well No. 47.

Drilling was commenced January 24, 1917.

This well is located between old wells drilled by the Murphy Oil Company, from which little information could be gathered at the time approval was given the company to shut off water at their proposed depth of 1800′. Attention was directed to the serious water condition of adjoining wells and that results obtained in drilling this well would probably afford some evidence toward the cause of this condition.

Records and peg models compiled by this department, subsequent to our Report on Proposed Operations, approved shut-off point and indicate that the first zone was encountered at a depth of 792′.

Ten inch casing was cemented at 1389′ and test of water shut-off approved. The second zone was encountered at 1391′ and according to the log continued to 1525′. There are no records at hand to show that the second zone was *tested*. Drilling was continued and 8¼″ casing cemented at 2377′. Study of the log and peg model indicates that top of the third zone probably begins with "brown shale, light showing of oil and gas" encountered at 2134′, or 143′ above the lowest shut-off point.

Following is a portion of our Report on Test of Water Shut-off, No. T 1-10, dated August 3, 1917:

> "Proposal to shut off water below a depth of 1800′ was not received, and approval of the shut off with 10″ casing cemented at a depth of 2383′ is withheld, pending investigation and receipt of report, which is hereby requested from the company, showing that this is the proper depth to shut off water and that oil formations shut off have been protected from water."

On August 10 the company replied to this report, stating that no reason was found for shutting off at 1800′ and that there were no indications of oil until a depth of 2134′, where "brown shale, light showing of oil and gas" was encountered and continued to 2154′, and that similar conditions prevailed at 2271′–2288′. The following statement was made in this letter: "In cementing 8¼″ casing at 2377′, sufficient cement—200 sacks—was used to go up behind the casing and protect from water formation logged 'light showing of oil' ".

No mention, however, was made about the protection of the second zone in which "oil sands" were logged and shut off. No definite evidence has been presented to show that the second zone has been protected from water.

The well was drilled to a depth of 2645′ and produces from the lower portion of the third zone. The well was put on the pump September 8, 1917, and produced as follows:

	September production
Barrels of clean oil	1,639
Barrels of water	
Per cent water	
Number of days produced	23

Study of the production record shows that the third zone carries clean oil at this well.

Well No. 48.

Drilling was commenced March 13, 1917.

The following is a part of our Report on Proposed Operations, written April 23, 1916:

> "Herewith please find data on Standard Oil Company's wells in the area adjoining this well. These data show that the water condition of some of these wells is serious.
>
> Records at hand indicate that two oil zones should be penetrated in this well. The upper sand carried heavy oil and possibly some water in the down-slope portion of the sand. The upper zone should be protected from water until such time as it is definitely proven that this sand carried water.
>
> Therefore I recommend that the company protect the upper zone from top water, and if water develops in the well from the upper zone sand that the lower zone sand be protected from this water.
>
> The accompanying data show that water has not been shut off at a uniform stratigraphic depth in this area, indicating that this fact is the cause of some of the water trouble in this section."

The company carried out the first part of our recommendation and shut off water above the first zone with 12½″ cemented at 1521′. Test of water shut-off was approved.

Ten inch casing was cemented at a depth of 2162′ and test of water shut off approved as satisfactory. The well was drilled to a depth of 2312′ and put on the pump September 23, 1917. A letter from the company states that the well averaged 221 barrels of oil and no water during the last 7 days in September.

Study of the log record and peg model indicates that the upper portion of the second zone was shut off with 10″ casing. There are no records at hand to show that tests were made to determine the presence or absence of "intermediate" water between the first and second zones. The production record shows that the second zone is free from water at this well.

Well No. 49.

Drilling was commenced May 3, 1917. The company originally proposed to shut off water at a depth of 2160′, and amended the notice by proposing to make an additional shut-off at 1400′. This department recommended first shut-off at about 1500′ and approved the second shut-off point at 2160′ as proposed.

The log shows that the top of the first zone was encountered at 1686′. Water was shut off with 12½″ casing cemented at 1687′. Test witnessed and approved on August 15, 1917. On August 21 the following letter was written to the company:

> "Our report on test of water shut-off, No. T 1-14, dated August 15, 1917, approved test of water shut-off with 12½″ casing cemented at a depth of 1687′, in Murphy-Whittier well No. 49, Section 26, T. 2 S., R. 11 W. Our decision No. CC-305, dated June 12, 1917, approved proposal to make additional shut-off at a depth of about 2160′ in order to protect the second oil zone.
>
> There appears to be no definite evidence as to the presence or absence of a water-bearing formation, in the area adjoining this well, between the first and second oil zones. Since recent wells drilled in this area make shut-offs above both of these zones, we think it would be advisable to thoroughly test the formation between 1687′ (shut-off point) and 2160′ (proposed shut-off point) in order to determine the kind and volume of fluid contained in these formations. This information should be of much value in planning future shut-offs above the first and second oil zones.
>
> We would appreciate having your views in this matter."

No reply to this letter has been received and suggestions contained therein have not been carried out. The manner in which the company ignored this letter suggests that more positive action than merely writing letters, seems necessary in matters of this kind.

The well reached a depth of 2235′ October 30, and drilling was being continued.

Well No. 50.

Notice of intention to commence drilling was received April 2, 1917. The company estimated that productive oil sand should be encountered at a depth of 2500′. The proposal to shut off water at 1950′ was approved.

Drilling was commenced May 25, 1917. A supplementary report on depth of water shut-off was made by this department on August 11, 1917, as follows:

> "A study of our peg model, showing development work subsequent to the issuance of our decision mentioned, indicates that water should be shut off in the neighborhood of a depth of about 1750′, providing an oil sand is not encountered above this depth."

There is some question as to the depth at which the first zone was encountered. The top of this zone may begin at 1465′, where "sandy shale showing a little heavy oil" was encountered, or it may begin at a depth of 1687′ with "Brown sandy shale showing a little heavy oil"; 10″ casing was cemented at 1641′, but failed to shut off water. The company succeeded in getting circulation around this casing and pumped in three tons of cement under 800 lbs. pressure. The well stands re-cemented at this time.

The drilling so far shows that careful work has been done and that the company is endeavoring to protect the first zone from water encountered in this well.

Well No. 51.

Drilling was commenced July 16, 1917. The proposed estimates of depth of water shut-off and depth at which the first zone should be encountered has been approved by this department.

Well No. 52.

Drilling was commenced August 23, 1917. The proposed estimates of depth of water shut-off and depth at which the first zone should be encountered has been approved by this department.

GENERAL SUMMARY.

The following wells were completed prior to December 1, 1913, when the property was taken over by the Standard Oil Company: Nos. 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27 and 28. Wells Nos. 4, 9, 10 and 27 had been abandoned by the Murphy Oil Company. The index map on the diagram of wells shows the location of Old Nos. 13, 16, 17 and 19, which were also abandoned by the Murphy Oil Company.

In general, the logs and histories of the old wells drilled by the Murphy Oil Company are very incomplete, due, perhaps, to the lack of foresight of the former owners to keep necessary records. On account of the lack of proper records and the serious water condition of many of the old wells, the Standard Oil Company was confronted with problems which appear to have been reflected into later wells drilled. Study of records filed here fail to show that *any* remedial work was done by the Standard Oil Company to eliminate water troubles in the old wells, except to abandon No. 26 and No. 28. Some of the present water trouble may be due to deterioration of casing, allowing water to enter them through the water string. Probably the greater part of the trouble is due to ineffectual methods of shutting off water and lack of knowledge of geological conditions in shutting off at proper depths.

The production report for the month of August, 1917, shows 38 producing wells. Twenty of these wells were completed by the Murphy Oil Company, and produced 14,926 barrels of clean oil and 33,630 barrels of water; out of a total of 73,709 barrels of oil and 70,755 barrels of water produced by all the wells on the property. According to these figures, the wells drilled by the Murphy Oil Company averaged 1681 barrels of water, each, and wells drilled by the Standard averaged 2063 barrels of water, each, during August. Wells drilled by the Standard Oil Company produced 37,125 barrels of water, which amounted to 52.4 per cent of all the water produced on the property during August.

It would seem unlikely that the cement jobs in the new wells would have failed to the extent of allowing so much water to enter these wells, or that the old wells should be the cause of the major portion of this trouble. Therefore it would seem reasonable to assume that the source of the water is either through the various zones, or "intermediate" water between them.

The following record of wells tends to show that the various oil zones penetrated do not carry "edge" water and that the *source* of most of the water produced by the various wells is "intermediate" water from between the oil zones.

The following wells produce from the first zone *only*:

Wells Nos. 40, 43 and 45. The combined production of these wells during August was *4523* barrels of oil and *687* barrels of water. These wells averaged less than eight barrels of water per producing day. They may be affected by water from adjoining wells, or make their own water resulting from ineffectual shut-offs. Well No. 45 averaged less than two barrels of water daily, and since this well is deeper stratigraphically than either No. 40 or No. 43, it suggests that the cause of the water condition of the latter wells does not result from "edge" water.

The following wells produce from the second zone *only:*

Wells Nos. 23, 38, 39, 42, 44, 46 and 48. No. 48 was completed September 23, daily average 221 barrels of oil and no water. Reference to "Map showing average amounts of water produced daily by various wells in August," Fig. 10, shows that *all* of these wells are shown in "yellow." Reference to similar map showing "oil" produced, Fig. 11, shows that they are among the best producers on the property.

These wells produced a total of 27,845 barrels of oil and 5 barrels of water during August. The figures show *absolutely* that the second zone does not carry "edge" water in present area drilled. These wells are fairly well distributed over the present proved area of the property. Special attention is directed to the fact that wells Nos. 44, 46, 42, 39 and 48 are among the farthermost producing wells, down the dip of the formation, and should be first of present producing wells on the property to show "edge" water from the second zone.

The following wells were drilled into the second zone and there is some question (on account of shut-off and perforation record) as to whether they produce from the first zone, in addition to the second zone:

Wells Nos. 21, 22, 24 and 37.

Of these Nos. 21 and No. 22 produce only a small amount of water and oil. Wells No. 24 and No. 37 produce relatively large quantities of water and oil. By referring to "Summary of evidence at each well," it will be noted that there was some question as to the effectiveness of water shut off above the first zone in well No. 24. The depths of these two wells below the second zone suggests the possibility of entrance of water from below this zone. It is possible that water may enter them from between the first and second zones. Adjoining well No. 44 may have been troubled with water from the same source, before shutting off immediately above the second zone, which work cleaned up the well.

The production of wells producing from the first or second zone individually indicates that the source of water is not through these zones. Therefore the source of water must be above them or below them. The water condition of these two wells shows the necessity of determining whether or not there is an "intermediate" water between the first and second zone. Attention is again called to the letter from this department dated August 21, 1917, to the Standard Oil Company, suggesting tests at well No. 49. These tests were not made.

Study of the peg model and cross section indicates that the following wells penetrate the third zone:

Nos. 1, 2, 3, 4, 5, 6, 7, 8, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 25, 26, 27, 29, 30, 31, 32, 33, 34, 35, 36, 41.

(Forty-seven was drilling during August.)

Of these wells, the ones shown in symbols and colors on the maps, "Average amounts of *water* and *oil* produced daily by various wells in August, 1917," see Figs. 10 and 11, produced during August.

The outstanding feature of the "water" map is that every well shown in *Red*, except No. 37, *produces* from the *third* zone.

Recent developments at well No. 47, in which water was shut off above the major portion of the third zone shows that this zone is free from water at this well, and shows further that "intermediate" water was encountered between the second and third zones.

Study of the records indicate that the first zone has been shut off in all of these wells, except, possibly, No. 25, in which the record is not entirely clear. Therefore, it appears that the source of most of the water produced by "third" zone wells is between the second and third zones, or possibly through the third zone in its down slope portion.

The log records show only two wells (13 and 19, drilled by Murphy Oil Company) in which water-bearing formations are reported below or between any of the three oil zones. In view of this and the number and distribution of wells producing large amounts of water, it seems that the former policy of drilling wells on this property should be changed so that water-bearing formations may be definitely located and recorded in future wells drilled, which penetrate these formations, in order that necessary remedial work on present well may be instituted and carried out in the proper manner.

On account of the large amount of water produced by wells on this property, it will be necessary to put in plugs and conduct certain tests to secure information relative to exact location of water, which should have been obtained at the time the wells were drilled.

It is remarkable that practically every well which produces from *one zone only*, produces *clean oil*, indicating that the earlier wells drilled are not responsible for the bulk of the water trouble on this property, as has been generally supposed by people not entirely familiar with the conditions as they actually exist.

RECOMMENDATIONS.

Recent developments show that the property offers many possibilities in the amount of recoverable oil and warrants the expenditure of considerable money in adequately protecting the various zones from water.

(1) Water should be shut off *above* the first zone in each new well drilled, particularly along the southern and western edges of the present producing areas. Three wells are now producing commercial quantities of oil from the *first zone only*, in this area. New wells drilled farther south and west may find increasing quantities of oil in this zone, at greater relative depths. The policy of protection should be pursued until it has been demonstrated that the first zone "pinches out"; carries "edge water," or is barren of oil.

(2) Possible water-bearing formations should be located between first and second zones. This should be done in deepening by stages and testing.

(3) Depth and thickness of possible water-bearing formations should be determined, so far as possible, in all new wells drilled *below* the second zone. (The main source of the present water trouble seems to be between second and third zones.)

(4) In the future, wells should not be drilled into the third zone until the "intermediate" water between these zones can be prevented from entering either the second or third zone.

(5) Suggestions made in "Summary of evidence at each well" regarding plugging lower portions of wells 24, 37 and 40 should be carried out as a matter of initial tests to determine, if possible, source of water entering these wells.

(6) The production of oil from the following wells probably does not pay for their maintenance and operation: Nos. 2, 3, 5, 6, 12, 13, 15, 19 and 22. No. 12 and No. 13 produce large quantities of water. The water condition of the property probably would be improved by properly plugging and abandoning all of these wells.

(7) The water situation could be greatly improved by shutting off water in wells Nos. 25, 32, 34, 35 and 36. Possibly this could be largely accomplished by effectively plugging these wells between the second and third zone.

(8) The condition of well No. 41 shows the necessity of immediate repair work.

(9) The depth at which fluid stands and amount of tubing in each producing well should be determined and used in a manner similar to the "Creme case" at Coalinga.

(10) Chemical analysis of water from wells which produce water may serve a purpose equally as useful, in determining source of water as at Coalinga.

(11) The value of perforation record has been pointed out in a number of cases in the report and extreme care should be exercised by the company in keeping record of perforation of oil strings.

(12) A definite system should be worked out between this department and the Standard Oil Company for protection of the various zones penetrated, with the use of the least amount of casing necessary. (Possibly this may mean the introduction of the mud-laden fluid method of drilling new wells, which penetrate more than one zone. This may best be accomplished by a meeting of representatives of the Geological and Producing Departments of the Standard Oil Company with representatives of this department in our Los Angeles office at an early date.

M. J. KIRWAN,
Deputy Supervisor.

DECISIONS.

COYOTE HILLS FIELD.

T. 3 S., R. 9 W., S.B.B. & M.

SECTION 18.

Union Oil Co.

G. & L. Well No. 15, alter casing. P 1-281.

Approved proposal to swedge out oil string.

G. & L. Well No. 40, supplementary to drill-plug bottom. P 1-54.

The company advised that five unsuccessful attempts were made to get cement to set near the bottom of the well. Approved a proposal to force mud into a sand penetrated near the bottom of the well, previous to placing cement above this sand. Production reports show that water was shut off.

G. & L. Well No. 41, shut off. T 1-12.

Shut-off approved.

G. & L. Well No. 42, shut off. T 1-19.

Approval of the test was not given pending receipt of information relative to character of the 8′ plug of formation found in the lower portion of the water string. At the time of the test it was not known whether or not this plug could prevent the entrance of water into the casing.

G. & L. Well No. 42, shut off. T 1-24.

It was found necessary to use the tools to clean out the 8′ plug mentioned in T 1-19. A subsequent test showed water to be satisfactorily shut off.

G. & L. Well No. 42, deepen. P 1-297.

After the well had been completed and produced about two months, the company proposed to deepen. A request was made by the department for the log of the well.

G. & L. Well No. 42, supplementary to deepen. P 1-311.

Approval to deepen was given with the understanding that, if the amount of water which the well was producing increased to damaging amounts, necessary repair work would be done.

G. & L. Well No. 42, plug bottom. P 1-357.

The well was deepened as proposed under P 1-311. Approved proposal to plug well between certain depths to shut off water reported encountered in sand near the bottom.

G. & L. Well No. 43, commence drilling. P 1-57.

Proposed water shut-off depth approved.

G. & L. Well No. 43, shut off. T 1-71.

Shut-off approved.

Standard Oil Co.

Well No. 1, abandon. P 1-3.

Proposed plan to abandon was approved. It was suggested that the company cut instead of shoot 8¼″ casing near the surface and drive a wood plug into the 8¼″ where cut and dump about 10 sacks of cement on top of the plug.

Well No. 1, supplementary to abandon. P 1-10.

Approved proposal from company to shoot, and plug with cement, between certain depths. This was in addition to work approved in Decision P 1-3.

SECTION 19.

San Diego Consolidated Oil Co.

Well No. 1, abandon. P 1-137.

Recommendations were made indicating depths at which well should be plugged with cement, and that department be notified so that inspections could be made to determine if cement was put in between proper depths and also determine if cement set properly.

San Diego Consolidated Oil Co.—Continued.

Well No. 1, test cement plug. T 1-74.

An inspection was made to locate the top of a cement plug and determine if cement set properly.

Well No. 1, test cement plug. T 1-88.

Approved the placing and setting of cement in the second cement plug.

Well No. 1, test cement plug. T 1-115.

Approved the placing and setting of cement in the third and last cement plug recommended by the department.

Well No. 3, deepen. P 1-51.

The proposal to deepen was approved.

Well No. 4, make production test. P 1-50.

This well was redrilled to shut off water. After bailing tests were made, the company received the approval of the department to pump the well for further test for water shut-off.

Calokla Oil Co.

Basten Well No. 1, alter casing. P 1-31.

Proposal to remove upper portion of oil string was approved.

Basten Well No. 2, alter casing. P 1-43.

It was recommended that the company make an effort to shut off water by shooting and plugging a certain portion of the lower part of the well before removing the 8¼″ casing.

Basten Well No. 2, redrill. P 1-88.

A supplementary notice received from the company gave additional information relative to former shooting and plugging and proposing to do additional shooting and plugging higher up. This proposal was approved.

Basten Well No. 3, alter casing. P 1-32.

Approved proposal to pull out upper portion of 8¼″ casing, leaving a lap of about 50 feet up into the water string.

Providential Oil Co.

Well No. 1, deepen. P 1-34.

Proposal to deepen was approved.

Well No. 5, abandon. P 1-340.

Study of the log of the well and our peg model indicated that well was not drilled deep enough to encounter oil bearing formations protected by wells in this territory. Approval to abandon was given. No plugging was required.

Fetterman Oil Co.

Well No. 1, abandon. P 1-97.

The company requested the department to issue recommendation covering work necessary in abandonment. Recommendations were made covering the details of work indicating the depths at which plugging should be done.

Well No. 1, test cement plug. T 1-87.

The inspection made both before and after the cement plug put in between depths of 3300′ and 3270′ showed that the recommended work had been done and cement set to the satisfaction of the department.

Well No. 1, test cement plugs. T 1-101.

This decision covers the inspection of the well both before and after the placing of two cement plugs. The results of the work were found to be satisfactory.

Well No. 2, abandon. P 1-99.

This report supplemented and amended former report No. CC-300. Recommendations were made in which depths of shooting and plugging were given.

Well No. 2, test of cement plugs. T 1-61.

The inspection of the first plug showed that additional cement was necessary to fill up the space required. The inspection of the second plug placed between depths of 2800′ and 2870′ proved satisfactory.

Well No. 2, test cement plug. T 1-67.

The results of inspection showed that a cement plug had been satisfactorily placed between depths of 2650′ and 2625′, as recommended. This completed the plugging of the well.

Fetterman Oil Co.—Continued.

Well No. 3, abandon. P 1-98.

Upon request of the company, specifications were issued covering work necessary in the abandonment of this well.

Well No. 3, test cement plug. T 1-130.

An inspection made both before and after the placing of a cement plug between depths of 3300′ and 3270′ proved satisfactory.

Well No. 3, test cement plug. T 1-137.

Inspections made before and after placing a cement plug between depths of 2980′ and 2940′ showed that this plug had been satisfactorily put in.

Well No. 3, test cement plug. T 1-143.

An inspection similar to the one under 'T 1-137 for cement plug between depths of 2760′ and 2720′ showed that work was done according to recommendations.

Well No. 3, test cement plug. T 1-153.

Approval was given the work of placing a cement plug between depths of 2550′ and 2500′. This completed the plugging of the well.

Fullerton Great West Oil Co.

Well No. 3, make pumping test. P 1-49.

Following shooting and plugging between depths of 2780′ and 2770′, the company proposed to make a pumping test to determine the effectiveness of the plugging. This proposal was approved.

Well No. 3, continue pumping. P 1-73.

The company advised that the water condition of the well had improved as a result of pumping. Approval was given proposal to continue pumping for thirty days. Following this, extensions were given for two additional 30-day periods.

Well No. 3, redrill. P 1-166.

Approved redrilling proposal to repair well in order to prevent water from above the oil bearing formation to enter the well.

Well No. 3, abandon. P 1-231.

Recommendations were made covering necessary work of shooting and plugging.

Well No. 3, test cement plug. T 1-171.

A test was witnessed to locate top of a cement plug reported between depths of 3780′ and 3770′. An error in measurement of 47′ was found by the inspector. Recommendations were made to use the tools and clean out until definite showings of cement were encountered.

Well No. 3, test cement plug. T 1-194.

The well was found open to a depth of 3780′. Cement was afterward put in filling up to 3760′. This completed the work for the first plug.

Well No. 3, test cement plug. T 1-193.

Inspections showed that a cement plug was put in between depths of 3704′ and 3684′, as recommended by the department.

Well No. 3, test cement plug. T 1-201.

A cement plug was satisfactorily placed between depths of 3518′ and 3490′.

Well No. 3, test cement plug. T 1-203.

The measurement of the depth to which the hole was open following shooting was witnessed and found satisfactory.

Well No. 3, test cement plug. T 1-214.

The results of an inspection showed that a cement plug had been put in between depths approved by the department. This completed the plugging of the well.

Section 29.

Union Oil Co.

Chapman Well No. 1, shut off. T 1-223.

The results of the test showed that water was entering the well at the rate of 125′ per hour. Approved proposal from the company to force cement back of the water string.

T. 3 S., R. 10 W., S.B.B. & M.

SECTION 8.

Tri-State Oil Co.

Well No. 1, shut off. T 1-55.

Test of water shut-off satisfactory. 3″ casing was cemented at a depth of 5135′.

Well No. 1, shut off. T 1-172.

2″ casing was cemented at a depth of 5472′ but failed to shut off water. However, approval was given to continue drilling prospecting for an oil bearing formation.

Well No. 1, abandon. P 1-367.

Approved proposal to abandon. Recommended that company place a 20′ plug of cement on the top of each string of casing after removing of as much of the upper portions as could be obtained. Approval was also given the company to make tests of formations formerly shut off.

SECTION 13.

Amalgamated Oil Co.

Anaheim Well No. 1, abandon. P 1-142.

Recommendations were made giving depths at which shooting and plugging should be done.

Anaheim Well No. 12, continue plugging. P 1-13.

Approved proposal to continue plugging the lower portion of the well.

Anaheim Well No. 12, shut off. T 1-127.

The results of the test and information furnished by the company relative to a pumping test indicated that the plug placed near the bottom of the well shut off the water.

Anaheim Well No. 28, plug lower part of well. P 1-25.

Approved proposal to plug lower portion of well as proposed by the company. recommended that in case this work did not shut off water, all old plugs be drilled out and a shot of about 150 pounds gelatine be exploded near the bottom and well replugged with cement.

SECTION 17.

Standard Oil Co.

M/C Well No. 31, shut off. T 1-39.

The results of the test showed that water was not shut off. Approved verbal proposal from a representative of the company to conduct further bailing tests and test casing for casing leak.

M/C Well No. 31, supplementary to drill. P 1-114.

Approved proposal to cement 6¼″ casing in next suitable formation at a depth not to exceed 100′ below former shut off point.

M/C Well No. 31, shut off. T 1-68.

The results of the test showed that water was not shut off with the 6¼″ casing. The test was not approved.

M/C Well No. 31, supplementary to drill. P 1-160.

Approval to rip off the 6¼″ casing at bottom of 8¼″, deepen and shut off water in next suitable formation was given. The old 6¼″ was to be filled with cement up to the point where cut off. Recommendation was made that company mud formations, between the shoe of the 8¼″ casing and new shut-off point, under a pressure of at least 400 lbs. per sq. in., previous to cementing the new string of 6¼″ casing.

M/C Well No. 31, supplementary to drill. P 1-198.

Approved proposal to shoot off lower portion of 8¼″ casing. On account of changed physical condition of well, minor changes were made in recommendations relative to depth of mudding made in report P 1-198.

M/C Well No. 31, supplementary to drill. P 1-356.

While sidetracking lower portion of old hole, the company found that a small amount of oil began flowing between the 8¼″ and 10″ casings. The company promptly filed a proposal to shoot the old holes together and thoroughly plug them; cement casing above sands formerly shut off in order to test them.

M/C Well No. 31, supplementary to drill. P 1-368.

Approved proposal making change in depth of placing one of the cement plugs mentioned in Report P 1-356.

M/C Well No. 36, commence drilling. P 1-109.

Proposed shut-off depth approved.

M/C Well No. 36, shut off. T 1-149.

The results of the test indicated that water was not shut off. Approved proposal to force cement back of the water string.

M/C Well No. 36, shut off. T 1-161.

Test of water shut-off was witnessed to determine the rate at which water was entering the well through a casing leak.

M/C Well No. 36, test. P 1-276.

Approved proposal to carry 6¼" casing from 100′ to 200′ below shoe of 8¼"; bridge inside of this 6¼", perforate and force cement through perforations in order to cement 6¼" and 8¼" casings together, to shut off water entering through casing leak.

M/C Well No. 36, shut off. T 1-176.

The test showed that water was not shut off. Approved proposal to force additional cement through the perforations in the 6¼" casing.

M/C Well No. 36, shut off. T 1-180.

The test showed that water was not shut off. A proposal from the company to force additional cement out through perforations in the 6¼" casing was approved.

M/C Well No. 36, shut off. T 1-187.

The company advised that the 6¼" casing was ripped ⅜"x8" and 40 sacks of cement forced out between the 6¼" and 8¼" casings. A subsequent test showed that water was not shut off.

M/C Well No. 36, shut off. T 1-198.

Following the test T 1-187, the company again ripped the 6¼" casing and forced out 50 sacks of cement. Subsequent tests witnessed showed that the company effected a complete water shut-off.

SECTION 18.

Standard Oil Co.

M/C Well No. 2, redrill. P 1-113.

The proposal to redrill on account of collapsed oil string, and deepen, was approved.

M/C Well No. 2, abandon. P 1-174.

Approved proposed method of shooting and plugging.

M/C Well No. 15, shut off. T 1-66.

Production test was witnessed to determine amount of water the well was making previous to recementing the 4¼" casing.

M/C Well No. 15, redrill. P 1-143.

Approved proposal to force cement back of 4¼" casing which had been cut off 40′ below the shoe of the water string. A bridge had been placed in the 4¼" below point where cut off.

M/C Well No. 15, shut off. T 1-83.

A production test showed that water was not entirely shut off. Recommended pumping for further test.

M/C Well No. 15, abandon. P 1-268.

The general plan of proposed shooting and plugging was approved. Recommendations were made concerning certain details of the work.

M/C Well No. 15, supplementary to abandon. P 1-295.

Approved proposal changing depth at which first cement plug should be placed.

M/C Well No. 15, test cement plug. T 1-183.

The first cement plug was found to have been placed as recommended.

Standard Oil Co.—Continued.

M/C Well No. 29, supplementary to drill. P 1-8.

A pumping test showed that a sand below the shoe of the 8¼″ casing was probably not productive. Approved proposal to cement 6¼″ casing below this sand.

M/C Well No. 29, shut off. T 1-17.

Shut-off approved.

M/C Well No. 30, supplementary to drill. P 1-11.

Approved proposal to continue drilling and cement casing above first showing of oil.

M/C Well No. 30, shut off. T 1-22.

Shut-off approved.

M/C Well No. 34, drill. P 1-19.

Approved depth at which company proposed to shut off water.

M/C Well No. 34, supplementary to drill. P 1-124.

A supplementary proposal to continue drilling to the first oil sand and shut off above same was approved.

M/C Well No. 34, shut off. T 1-65.

Shut-off satisfactory.

M/C Well No. 35, drill. P 1-18.

The proposal from the company to shut off water at a depth of about 3300′ was approved.

M/C Well No. 35, shut off. T 1-49.

The results of the test showed that about 229′ of water and about 250′ of oil entered the well in 25 hours. The company agreed to file a proposal covering further work.

M/C Well No. 35, supplementary to drill-recement. P 1-135.

A proposal to pump well in order to try and open channel back of the 8¼″ casing and then force cement back of this casing was approved.

M/C Well No. 35, shut off. T 1-73.

The work approved in Report P 1-135 was carried out, but was not successful in shutting off the water.

M/C Well No. 35, recement. P 1-176.

Approved proposal to force additional cement back of the 8¼″ casing.

M/C Well No. 35, shut off. T 1-111.

The results of the test showed that water was not shut off.

M/C Well No. 35, supplementary to drill-recement. P 1-217.

Approved proposal to plug up 10′ inside of 8¼″ casing and make casing test; perforate bottom joint of 8¼″ and force cement out through perforations.

M/C Well No. 35, shut off. T 1-135.

Previous to carrying out work mentioned in Report P 1-217, the company pumped 40 sacks of cement into well under 1200 lbs. pressure. A test showed that a small amount of water and no oil entered the well. Recommended drilling 10′ more and test again.

M/C Well No. 35, shut off. T 1-142.

The test showed an increase of fluid, consisting of about one half water and one half oil. Approved proposal to plug bottom 10′ of water string and perforate above plug to determine if water was entering well from back of water string.

M/C Well No. 35, shut off. T 1-158.

Work approved in Report T 1-142 was carried out. Subsequent tests showed a small amount of oil and water entered, possibly through the plug which was cleaned out to 6′ in length. Approved proposal to replug with cement.

M/C Well No. 35, shut off. T 1-160.

The lower part of the 8¼″ was replugged as indicated in Report T 1-158. A test showed that 75′ of water and 15′ of oil entered the casing in 12 hrs., indicating that there probably was a passage of fluid back of the water string.

Standard Oil Co.—Continued.

M C Well No. 35, supplementary to drill. P 1-220.

Approved proposal to shoot and plug lower portion of the well and cement new water string above the oil sand.

M C Well No. 35, shut off. T 1-234.

The test showed that water was not shut off. No oil was noted during the test, indicating that the source of the water was above the oil sand. Approved proposal to recement.

M C Well No. 35, shut off. T 1-250.

Water was not shut off. Approved proposal to swab well in order to open up channel back of 8¼″ casing and force cement back of this casing.

M C Well No. 37, commence drilling. P 1-46.

Shut-off depth approved.

M C Well No. 37, shut off. T 1-90.

On account of the mixture of oil and water, the results of the test did not afford sufficient information to approve the shut-off. Recommended further bailing tests.

M C Well No. 37, shut off. T 1-95.

The results of this, and former tests, indicated, but did not clearly demonstrate that water was shut off. Approval was given to continue drilling with the understanding that production test would be witnessed 30 days after completion.

M C Well No. 37, shut off. T 1-190.

The results of production test showed that the well was making only 0.4 per cent water. Water shut-off approved.

M C Well No. 38, commence drilling. P 1-108.

The department's estimate of depth of water shut-off and depth to oil bearing formations was given.

M C Well No. 38, supplementary to drill. P 1-233.

Approved proposal to continue drilling and cement at a depth lower than indicated for shut-off in P 1-108.

M C Well No. 38, shut off. T 1-182.

Several tests were witnessed and, due to the amount of oil in the well and fact that free water was not definitely located, the company decided to make further bailing tests.

M C Well No. 38, shut off. T 1-188.

On account of the rise of a small amount of water while standing bailed for test, the company's proposal to make production test 30 days after completion was approved.

M C Well No. 42, commence drilling. P 1-180.

The proposed shut off depth was approved.

M C Well No. 42, shut off. T 1-207.

Several tests witnessed were not conclusive, on account of the mixture of water and oil and change in level of the free water. It was suggested that the company bail all free water from the well and make a further test.

M C Well No. 42, shut off. T 1-208.

All free water had been bailed out. During the test the oil in the well stood near the surface. Samples of fluid from various depths showed a small amount of water and emulsion by centrifuge test. Approval to continue drilling was given. Recommended production test after completion.

M C Well No. 44, commence drilling. P 1-288.

Recommended that the company test out an upper oil bearing formation which had been shut off in all other wells drilled in this field.

M C Well No. 44, shut off. T 1-248.

Recommendations in Report P 1-288 were carried out. On account of the amount of oil in the hole, a bailing test did not conclusively show that water was shut off. Approved proposal from the company to make a further bailing or pumping test.

Standard Oil Co.—Continued.

M/C Well No. 45, commence drilling. P 1-299.

Recommendation was made that company shut off above a specified depth, so that shut-off could be tested before entering oil bearing formation, and in this way simplify the test.

SECTION 19.

Standard Oil Co.

M/C Well No. 10, deepen. P 1-320.

Water condition of well satisfactory, approved proposal to redrill and deepen.

M/C Well No. 26, redrill. P 1-45.

Approved proposal to bridge in oil string below water string, remove oil string above bridge, replace perforated casing with solid pipe having perforated die-nipple on bottom, screw on to casing remaining in well and force cement through the perforations below water string in an effort to shut off "top" water.

M/C Well No. 26, supplementary to redrill. P 1-145.

A supplementary notice from the company states that the oil string had been plugged with cement from bottom of hole to a point near the water sring and tests showed that water was entering well from above the oil sand. Approved proposal to rip off 6¼″ casing about 20′ below water string and cement same above first oil sand.

M/C Well No. 26, shut off. T 1-81.

Test of water shut-off approved.

M/C Well No. 26, deepen. P 1-218.

Proposal to deepen approved.

M/C Well No. 32, shut off. T 1-5.

Shut-off approved.

M/C Well No. 33, shut off. T 1-48.

The results of several tests indicated but did not clearly demonstrate that all water was shut off. Recommended that company continue bailing tests or complete well and make production test after completion.

M/C Well No. 33, shut off. T 1-189.

Production test showed that well averaged less than 0.4 per cent water. Test of water shut-off approved.

M/C Well No. 40, commence drilling. P 1-186.

Proposed shut-off depth approved.

M/C Well No. 41, commence drilling. P 1-210.

Proposed shut-off depth approved.

M/C Well No. 41, shut off. T 1-245.

A test was witnessed previous to drilling out cement plug in bottom of water string, to determine the rate at which water was entering through a casing leak.

M/C Well No. 41, supplementary to drill. P 1-373.

Approved proposal to drill out cement in bottom of water string and if test showed that no water other than through casing leak was entering well to perforate water string just below the leak and force cement through the perforation and cement together the water string and next outside casing.

M/C Well No. 41, shut off. T 1-247.

There was no apparent change in the water level after drilling out plug below water string. The company proposed to plug the lower part of the water string and make another casing test.

M/C Well No. 43, commence drilling. P 1-214.

Proposed shut-off depth approved.

M/C Well No. 43, supplementary to drill. P 1-362.

Approved supplementary proposal to continue drilling below depth approved in P 1-214, prospecting for oil bearing formations.

M/C Well No. 46, drill. P 1-333.

Proposed shut-off depth approved.

Standard Oil Co.—Continued.

M/C Well No. 48, drill. P 1-360.

Recommended that company shut off above first oil bearing formation penetrated below a specified depth.

M/C Well No. 49, drill. P 1-361.

Recommendation similar to P 1-360 was made.

SECTION 20.

Standard Oil Co.

M/C Well No. 39, commence drilling. P 1-127.

Shut-off depth approved.

M/C Well No. 39, shut off. T 1-169.

The results of the bailing test indicated but did not afford sufficient information to give final approval. Recommended production test after completion of the well.

M/C Well No. 39, shut off. T 1-233.

Test of water shut-off approved after production test was witnessed.

M/C Well No. 47, drill. P 1-355.

The estimated depth at which oil bearing formation should be penetrated, furnished by the company, agreed with information derived from study of peg model constructed by this department.

SECTION 21.

Union Oil Company.

Bastanchury Well No. 5, shut off. T 1-13.

Test of water shut-off approved.

Bastanchury Well No. 5, redrill and plug. P 1-250.

Approved proposal to redrill and plug off "bottom" water. Recommended that company force thin mud into lower sand.

Bastanchury Well No. 5, supplementary to redrill. P 1-255.

Approved proposal from company to shoot lower portion of well over a greater distance than recommended in report P 1-250.

Bastanchury Well No. 5, supplementary to redrill. P 1-293.

Approved proposal to remove all 4½" casing possible and redrill with rotary to a point where shooting and plugging was formerly proposed and approved.

SECTION 22.

Union Oil Company.

Hole Well No. 17, shut off. T 1-32.

Shut-off approved.

Standard Oil Company.

Coyote Lease No. 2 Well No. 8, alter casing. P 1-146.

Approved proposal to remove upper portion of the oil string.

Coyote Lease No. 2 Well No. 9, supplementary to drill. P 1-48.

Approved proposal to drill below the 10" casing prospecting for lower oil bearing formations above which the company planned to try another shut-off.

Coyote Lease No. 2 Well No. 9, shut off. T 1-46.

Shut-off approved.

Coyote Lease No. 2 Well No. 9, plug and alter casing. P 1-206.

Approved proposal to shoot and plug lower portion of well.

SECTION 23.

Union Oil Company.

Hole Well No. 8, shut off. T 1-144.

Shut-off approved.

Hole Well No. 10, deepen. P 1-222.

Proposal to deepen was approved.

Well No. 12, shut off. T 1-145.

Shut-off approved.

Union Oil Co.—Continued.

Hole Well No. 15, shut off. T 1-27.

Shut-off approved.

Hole Well No. 16, shut off. T 1-29.

The result of the test indicated but did not give sufficient information to prove that all water was shut off. Approval to continue drilling was given with understanding that production test would be witnessed after completion.

Hole Well No. 16, shut off. T 1-146.

Shut-off approved.

Amalgamated Oil Co.

Hualde Well No. 2, shut off. T 1-20.

Shut-off approved.

Hualde Well No. 5, commence drilling. P 1-192.

Proposed shut-off depth approved.

Hualde Well No. 5, shut off. T 1-154.

Shut-off approved.

Hualde Well No. 9, shut off. T 1-63.

Test of water shut-off approved.

Well No. 23, deepen. P 1-91.

Approved proposal to deepen.

Hualde Well No. 40, abandon. P 1-264.

The abandonment notice received from the company outlined in detail the proposed work of shooting and plugging. The proposal was approved. It was recommended that the company notify the department in order that the placing of cement plugs could be witnessed.

Hualde Well No. 40, test cement plug. T 1-197.

In cleaning out the well the company was able to reach the top of a former cement plug. Approval was given to plug the open hole with cement from this plug up to the shoe of the 6¼″ casing.

Hualde Well No. 40, test cement plug. T 1-202.

The results of this test showed the company had satisfactorily carried out their proposal under T 1-197.

Hualde Well No. 40, test cement plug. T 1-249.

The company advised that certain shooting and plugging was done following inspection made by the department under T 1-202. The test witnessed to determine setting of cement below the 8¼″ casing showed that cement did not set properly. Recommended that company clean out the cement to a point below the casing and replug with cement.

Thomas Strain.

Well No. 1, redrill. P 1-58.

Study of the records indicated that the 6¼″ casing cemented at a depth of 4000 ft. failed to prevent water above this depth from passing to lower levels in the well. Therefore it was recommended that an effort be made to force cement back of this casing.

Well No. 1, plug bottom. P 1-84.

Before endeavoring to recement the 6¼″ casing, it was proposed to clean out to bottom, 4202′, and plug well by stages in order to definitely locate the water. This proposal was approved. The results of this work finally showed that water was not shut off by the 6¼″ casing.

SECTION 24.

The Petroleum Company.

Gilman Well No. 1, shut off. T 1-28.

The results of a bailing test indicated that water above the first oil sand was not entering this sand. Recommended drilling out the plug and test well.

Gilman Well No. 1, make pumping test. P 1-64.

Approved proposal to make pumping test and a bailing test later if advisable.

The Petroleum Co.—Continued.

Gilman Well No. 1, shut off. T 1-37.

This test was made to determine the fluid level in the well.

Gilman Well No. 1, cement. P 1-96.

The results of pumping test showed that a comparatively small amount of water was entering the well either through the first or second oil sand. Approved proposal to shut off the first oil sand.

Gilman Well No. 1, shut off. T 1-51.

The results of a bailing test were not conclusive. Approved proposal to drill to original depth and pump well for a further test.

Amalgamated Oil Company.

Anaheim Well No. 40, shut off. T 1-104.

The results of a production test showed that the plugging of the lower portion of the well did not shut off water. Recommended further repair work.

Anaheim Well No. 41, commence drilling. P 1-55.

The company was advised that the department was constructing a peg model and that recommendations relative to shut-off, after a depth of about 2500′ was reached in drilling, would be made.

Anaheim Well No. 42, commence drilling. P 1-189.

Information derived from study of peg model was furnished the company relative to depth at which the first oil zone should be penetrated.

Anaheim Well No. 42, supplementary to drill. P 1-298.

Approved supplementary proposal to cement 10″ casing above first oil zone.

Anaheim Well No. 42, shut off. T 1-215.

The results of the test did not afford sufficient information to give final approval. Recommended that company bail all water from well.

Anaheim Well No. 42, shut off. T 1-225.

Shut-off approved.

Anaheim Well No. 56, shut off. T 1-41.

Shut-off approved. A proposal from the company to drill only through the first oil sand and test same by pumping was also approved.

Anaheim Well No. 56, shut off. T 1-107.

Production test made in accordance to Report T 1-41 showed well free from water.

SECTION 28.

Union Oil Company.

Bastanchury Well No. 6, supplementary to drill. P 1-251.

The company was advised that it would be satisfactory to the department to drill until oil bearing formations were encountered and shut off above same.

Bastanchury Well No. 6, shut off. T 1-175.

The results of the test showed that water was not shut off.

Bastanchury Well No. 6, supplementary to drill. P 1-310.

The company advised that oil bearing formation had not been encountered in the well. Approval to continue drilling and shut off above first oil bearing formation was given.

T. 3 S., R. 11 W.

SECTION 4.

Union Oil Company.

Myer Well No. 3, supplementary to drill. P 1-169.

The company advised that they had considerable mechanical difficulty at this well in making tests and that oil bearing formation had not been encountered. A proposal to continue drilling was approved.

SECTION 13.

Standard Oil Company.

Emery Well No. 5, shut off. T 1-4.

A bailing test was witnessed after the lower portion of the well had been plugged. Approved proposal to pump well for further test.

Standard Oil Co.—Continued.

Emery Well No. 5, continue plugging. P 1-12.

Approved proposal to put in an additional cement plug in lower portion of well and perforate the water string to test reported oil bearing formations formerly shut off.

Emery Well N. 5, abandon. P 1-141.

Approval to abandon was given indicating depths at which shooting and plugging should be done.

Emery Well No. 5, shut off. T 1-80.

A production test was witnessed which showed that well was making a large amount of water and no oil. Approved proposal to do further plugging.

Emery Well No. 5, shut off. T 1-114.

A test was witnessed to determine productiveness of formations formerly shut off. The results of the test indicated the advisability of further plugging towards abandonment.

Emery Well No. 5, test cement plug. T 1-120.

The inspector visited the well to witness certain measurements previous to placing a cement plug in the formation according to former recommendations of the department.

SECTION 24.

Standard Oil Co.

Emery Well No. 16, alter casing. P 1-354.

Approved proposal to bridge in oil string below water string and force cement out through perforations above the bridge in an effort to shut off "top" water.

Emery Well No. 29, deepen. P 1-280.

Proposal approved.

Well No. 32, shut off. T 1-6.

The results of the test indicated that water was not shut off. Approved proposal to make further bailing tests.

Emery Well No. 32, supplementary to deepen. P 1-21.

Recommended that company make another attempt to shut off above the first oil sand rather than below it, as proposed.

Emery Well No. 32, deepen. P 1-85.

After considerable discussion and correspondence, approval was given to shut off below the first oil sand following a definite program of mudding and cementing. The company agreed to drill another well and test formation shutoff in this well.

Emery Well No. 32, deepen. P 1-93.

On account of the changed condition of the former water string, additional recommendations were made relative to shooting and plugging the old hole before sidetracking the lower portion of it.

Emery Well No. 32, mudding operations witnessed. T 1-44.

The operations witnessed while the first oil sand was mudded under pressure were recorded in this report.

Emery Well No. 32, mudding and cementing witnessed. T 1-47.

Final mudding and cementing operations were witnessed by a member of the department and covered in this report.

Emery Well No. 32, shut off. T 1-64.

On account of the mixture of water and oil and change in water level it was necessary to witness four tests before final approval of the shut-off was given.

Emery Well No. 33, shut off. T 1-9.

The test was not satisfactory on account of the fact that water was found 500′ below depth reported bailed. Approval was given to make further bailing tests.

Emery Well No. 33, shut off. T 1-11.

The results of the test were not conclusive in showing that water was completely shut off. Recommended further bailing tests or production test after completion of well.

Standard Oil Co.—Continued.

Emery Well No. 33, redrill. P 1-53.

Approved proposal to plug lower portion of well stating that it seemed necessary to plug in stages and test after each plug.

Emery Well No. 33, shut off. T 1-220.

A production test showed well, producing an amount of water which was not considered damaging. Approved further pumping of well.

Emery Well No. 34, commence drilling. P 1-90.

Recommendations were made relative to depth of water shut-off in accordance with former understanding with company to test formations which were shut off in an adjoining well.

Emery Well No. 34, shut off. T 1-125.

The results of this test showed that there was a failure to shut off water or that a water bearing formation had been penetrated immediately below the shoe of the water string.

Emery Well No. 34, deepen. P 1-249.

The proposal to shut off at a lower depth was not approved pending further tests. It was suggested that company plug lower portion of water string and perforate above the plug to determine if water was passing on the outside of this casing.

Emery Well No. 34, shut off. T 1-162.

The suggested work in Report P 1-249 was carried out. Water entered the casing through the perforations and rose to near the surface.

Emery Well No. 34, test. P 1-270.

Approved proposal from the company to force cement out through the perforations in the water string.

McNally Well No. 2, abandon. P 1-9.

Certain plugging had been done in the lower portion of this well previous to the receipt of the abandonment notice. Approval was given to remove the upper portion of 8¼″ and 10″ casings without further plugging.

Well No. 2, supplementary to abandon. P 1-62.

Company converted well into a water well and turned it over to the owners of the land.

MONTEBELLO FIELD.

T. 1 S., R. 11 W., S.B.B. & M.

SECTION 31.

Standard Oil Co.

Baldwin Well No. 16, commence drilling. P 1-289.

Approved proposal from company to shut off water about 20′ above the first showing of oil.

Baldwin Well No. 16, shut off. T 1-226.

The results of the test were not conclusive, on account of the mixture of water and oil found above the point to which water was bailed. Approved proposal to conduct further tests.

Baldwin No. 16, shut off. T 1-229.

The results of the tests indicated but did not conclusively demonstrate that water was shut off. Approval to continue drilling and make production test was given.

Baldwin Well No. 16, shut off. T 1-231.

The company made further tests which indicated but did not definitely prove that water was shut off. Approved proposal to bail all water from the well and run oil into the well to maintain a fluid level of at least 1200′, so as not to endanger the 12½″ casing.

Baldwin Well No. 16, shut off. T 1-238.

Shut-off approved.

General Petroleum Co.

Well No. 1, commence drilling. P 1-171.

The information given in the notice of intention to drill was satisfactory.

Potrero Chico Well No. 1, shut off. T 1-204.

Shut-off not satisfactory. Company proposed cement string of 10″ casing.

Petroleum Midway Co.

Taylor Well No. 1, commence drilling. P 1-240.

Recommended that company shut off water above first oil bearing formation encountered, in order that such formation could be properly tested.

Darlington Well No. 1, commence drilling. P 1-239.

Recommended that company shut off water above the first oil bearing formation penetrated, in order that such formation could be properly tested.

Darlington Well No. 1, supplementary to drill. P 1-279.

The supplementary notice stated that the 12½″ casing which had been cemented, collapsed about 650′ above the shoe. Approved proposal to cement 10″ casing above the first oil bearing formation penetrated in the well.

Darlington Well No. 1, shut off. T 1-222.

Approval of the shut-off was not given on account of the fact that certain oil bearing formations were shut off by the 10″ casing without approval of the department, and without demonstration that such formations were protected from water.

California Star Oil Co.

Well No. 1, commence drilling. P 1-120.

Recommended that company shut off water above first oil bearing formation encountered in order that a proper test could be made. Information relative to neighboring wells was furnished the company.

Well No. 1, supplementary to drill. P 1-215.

Approved supplementary notice to sidetrack certain casing and continue drilling, according to recommendations in decision P 1-120.

Section 32.

Amalgamated Oil Co.

Durfee Well No. 1, commence drilling. P 1-115.

At the time this decision was written, there was not sufficient information available to indicate the depth at which water should be shut off.

Cheney Stimson Oil Co.

Well No. 1, commence drilling. P 1-312.

Recommended that the company take samples of formation at certain intervals and shut off above first oil-bearing formation penetrated.

Section 33.

Union Oil Co.

San Gabriel Well No. 1, commence drilling. P 1-256.

No recommendation as to depth of shut-off was made, except that water should be shut-off above first oil-bearing formation encountered, in order that a proper test could be made.

Section 35.

Shell Co. of California.

Well No. 1, commence drilling. P 1-219.

The plan by which the company proposed to drill this well was approved.

T. 2 S., R. 11 W., S.B.B.& M.

Section 5.

Shell Co. of California.

Well No. 1, commence drilling. P 1-372.

The proposed plan of drilling this well was approved. Recommended shut-off above first oil-bearing formation.

Potter Oil Co. of California.

Well No. 1, commence drilling. P 1-319.

This decision stated that there was not sufficient information at hand to indicate the depth at which oil-bearing formations should be encountered. Recommended shut-off above first oil-bearing formation penetrated.

Keeler & Taussig.

Well No. 1, commence drilling. P 1-350.

Approved proposal outlining the details of plan of drilling this well.

T. 2 S., R. 11 W.

SECTION 6.

Standard Oil Co.

Temple Well No. 2, commence drilling. P 1-24.

Approved shut-off depth proposed by the company.

Temple Well No. 2, shut off. T 1-21.

Shut-off approved.

Temple Well No. 3, commence drilling. P 1-60.

Recommended that company shut off water between depths of about 1385′ and 1390′ in order to test formations immediately below the shut-off point.

Temple Well No. 3, supplementary to drill. P 1-74.

Report No. P 1-60 was supplemented in order to approve proposal from company to shut off about 23′ above the first showing of oil which had been penetrated in drilling.

Temple Well No. 3, shut off. T 1-38.

The results of the test indicated but did not conclusively demonstrate that all water was shut off. Approved proposal to continue drilling and make production test about 60 days after completion.

Temple Well No. 3, shut off. T 1-210.

The results of a tank gauge of 19 hours production showed well making no water. Shut-off approved.

Temple Well No. 4, commenec drilling. P 1-156.

The proposed shut-off depth was approved.

Temple Well No. 4, shut off. T 1-92.

Water was not shut off. Approved proposal to force cement back of the water string.

Temple Well No. 4, shut off. T 1-119.

A test witnessed after the well had been recemented showed that water was not shut off. Stated that study of peg model indicated that first oil-bearing formation should be penetrated about 300′ below present shut-off point. Drilling was resumed.

Temple Well No. 4, shut off. T 1-157.

Shut-off approved.

Temple Well No. 5, commence drilling. P 1-199.

Recommended that company keep department informed relative to character of formations penetrated below a depth of 1150′. Suggested the advisability of drilling till a showing of oil was found before shutting off.

Temple Well No. 5, shut off. T 1-133.

Shut-off approved.

Temple Well No. 6, commence drilling. P 1-313.

Approved proposal to drill to first oil-bearing formation and shut off water above same.

Baldwin Well No. 5, commence drilling. P 1-23.

Proposed shut-off depth approved.

Baldwin Well No. 5, plug below water string. P 1-47.

Approved proposal to plug hole below water string in order to determine source of water entering the well.

Baldwin Well No. 5, make production test. P 1-79.

The company advised that cement plug was put in up to within 5′ of shoe of water string and well made 5′ of water per hour, and that after 13′ of the plug was cleaned out the well made about 15′ of water per hour. Approved proposal to clean out remainder of cement plug and pump well and determine the amounts of oil and water produced per day.

Baldwin Well No. 5, supplementary to drill-cement casing. P 1-117.

Approved proposal to cement 10″ casing 40′ below 12½″ casing and above the oil sand reported near the bottom of the well.

Baldwin Well No. 5, supplementary to drill, alter casing. P 1-125.

The company advised that it would be necessary to shoot off the two lower joints of the 12½″ casing. Approved proposal to force cement back of 12½″ casing previous to carrying out work formerly approved in Report P 1-117.

Baldwin Well No. 5, shut off. T 1-59.

A test was witnessed to determine the rate at which water entered the well through a leak in the 12½″ casing.

Baldwin Well No. 5, shut off. T 1-78.

The results of the test showed that 10″ casing which had been cemented, failed to shut off water. Recommended further tests or that company file a new proposal.

Baldwin Well No. 5, supplementary to drill. P 1-183.

The company expressed an opinion that water was entering the well from below the 10″ casing and that the 10′ of oil sand penetrated at the bottom of the well correlated with producing oil sand in adjoining wells. The department recommended that company try and force cement back of the 10″ casing before carrying out further work.

Baldwin Well No. 5, shut off. T 1-110.

Circulation was established between the 10″ and 12½″ casings and well recemented with 60 sacks of cement. The test showed that water was not shut off. Recommended that company again try for circulation between 10″ and 12½″ casings.

Baldwin Well No. 5, shut off. T 1-159.

Following the above test the entire string of 10″ casing was pulled out and subsequently cemented at a point 150′ higher than formerly. The results of the test indicated that water from above the shut-off point was prevented from passing to lower levels in the well. Recommended test of formations between shut-off point and original depth drilled.

Baldwin Well No. 5, shut off. T 1-179.

The test showed that water was entering the well when redrilled to within 50′ of original depth drilled. It was recommended that the company plug the lower portion of the redrilled hole in order to locate the source of the water.

Baldwin Well No. 5, shut off. T 1-199.

An 80′ plug decreased the rate at which water was entering the well. Further plugging was suggested but not required.

Baldwin Well No. 5, shut off. T 1-206.

A representative of the department visited the well to note the showing of oil encountered 12′ below the former depth drilled. Specifications for mudding upper formation and approval to shut off immediately above the last showing of oil was given.

Baldwin Well No. 5, shut off. T 1-237.

Shut-off approved.

Baldwin Well No. 15, commence drilling. P 1-300.

Approved proposal to shut off water above first oil-bearing formation.

Baldwin Well No. 15, shut off. T 1-230.

The results of the test showed that a complete shut-off had not been effected. Approval to plug below and up into water string and make casing test was given.

Baldwin Well No. 15, supplementary to drill. P 1-375.

Approved proposal to clean out to original depth drilled and test by pumping or bailing to determine amount of oil well would produce.

Baldwin Well No. 19, commence drilling. P 1-342.

Approved proposal to drill to first showing of oil and shut off water above same.

Standard Oil Co.—Continued.

Baldwin Well No. 10, supplementary to drill. P 1-370.

The company reported that well had been drilled 100′ below depth at which oil had been expected. Approved proposal to continue drilling till oil was encountered and then shut off above the oil.

Petroleum Midway Company, Ltd.

Prugh Well No. 1, commence drilling. P 1-41.

At the time this decision was written there was not sufficient data at hand to indicate the depth at which water should be shut off.

Prugh Well No. 1, supplementary to drill. P 1-69.

Approved proposal to shut off water at depth given in the supplementary notice.

Prugh Well No. 1, shut off. T 1-36.

10″ casing landed in formation did not make a complete shut-off.

Prugh Well No. 1, supplementary to drill. P 1-94.

Approved proposal to drill to oil-bearing formation and cement either 8¼″ or 10″ casing above same.

Prugh Well No. 1, supplementary to drill. P 1-139.

10″ casing was cemented 32′ above the first oil sand penetrated. Approved proposal to plug between oil sand and shoe of 10″ casing and in case water was found to be entering well to cement 8¼″ casing immediately above the oil sand.

Prugh Well No. 1, shut off. T 1-109.

This test was witnessed to locate the shoe of the 8¼″ casing.

Prugh Well No. 1, supplementary to drill. P 1-216.

Approved proposal to force mud into the oil sand, which had been penetrated 24′, and then make an effort to force cement back of the water string in order to shut off water.

Prugh Well No. 2, commence drilling. P 1-225.

Recommended that company shut off water above the first oil-bearing formation penetrated.

Prugh Well No. 2, shut off. T 1-166.

The results of the test showed that water from above the shut-off point had been prevented from passing to lower levels in the well. Approval to continue drilling was given. Called attention of company to possibility that oil-bearing formations had been shut off.

Prugh Well No. 3, commence drilling. P 1-359.

Recommended that company shut off water above first oil-bearing formation penetrated and that company secure samples of formation at certain intervals in drilling between a given depth and the shut-off point.

Piuma Briano Well No. 1, commence drilling. P 1-211.

At the time this decision was written there was not sufficient information at hand to indicate the depth at which oil-bearing formation should be penetrated. Recommend shut-off above first oil-bearing formation.

P. & B. Well No. 1, shut off. T 1-178.

Shut-off approved.

P. & B. Well No. 1, supplementary to drill. P 1-361.

Recommended that company plug the well in 50′ instead of 100′ stages as proposed. The work of plugging to begin at the bottom of the well.

Piuma Briano Well No. 2, commence drilling. P 1-345.

The company stated that they were unable to furnish an estimate of depth at which oil should be found or water shut off. The department recommended that the company shut off above the first oil-bearing formation penetrated.

Walters Well No. 1, commence drilling. P 1-316.

This decision was similar to P 1-345.

Red Star Petroleum Company.

Well No. 1, commence drilling. P 1-28.

The company proposed to shut off water at a depth of 1350′. It was unanimously agreed at a conference of officials of the Red Star Petroleum Company with representatives of adjoining companies and the deputy supervisor that it would be advisable to cement at a depth of about 1500′ and test reported oil-bearing formations which had been encountered below this depth.

Well No. 1, supplementary to drill. P 1-67.

The company advised that water was found to be entering the well after cleaning out 10′ below the shoe of the water string and that subsequent tests convinced them that the reported oil sands did not carry oil.

Well No. 1, supplementary to drill. P 1-71.

Approved a proposal to cement 8¼″ casing above a showng of oil reported 195′ below the 10″ casing.

Well No. 1, shut off. T 1-33.

Shut-off approved.

Well No. 2, commence drilling. P 1-153.

The company advised that they were unable to furnish an estimate of depth to oil-bearing formation or depth at which water should be shut off. The department recommended that the company shut off water above first formation found to carry oil.

Well No. 2, shut off. T 1-97.

The results of a test witnessed by the department showed that 181′ of water and no oil entered the well in 13½ hours. At the time of this test a plug, probably formation, was found 6′ above the shoe of the water string. Approved proposal from company to put in 10″ casing, clean out below the water string and make a further bailing test.

Well No. 2, shut off. T 1-103.

The results of this test showed that the 12½″ casing failed to prevent water from entering the well. The source of the water was not determined. The log showed that oil-bearing formations had not been encountered. Approved proposal to continue drilling. Recommended that company shut off water above first oil-bearing formation encountered in drilling.

Well No. 2, supplementary to drill. P 1-259.

Approved a proposal to cement 10″ casing about 150′ above the depth to which the well had been drilled. The company filed this proposal after a conference had been held with the department.

Well No. 3, commence drilling. P 1-178.

Recommended that company shut off water above first oil-bearing formation encountered.

Well No. 3, shut off. T 1-129.

Shut-off approved.

Baldwin No. 4, commence drilling. P 1-344.

The company proposed to shut off water at a depth of about 1800′. Recommended that company shut off water above first oil-bearing formation encountered and that samples of formation should be secured about every 10′ beginning at a depth of about 1450′.

Baldwin Well No. 5, commence drilling. P 1-346.

The company advised that they were unable to estimate the depth at which oil-bearing formation should be encountered or depth at which water should be shut off. The department recommended that the company shut off water above the first oil-bearing formation penetrated.

W. T. McGinley.

Well No. 1, commence drilling. P 1-175.

Proposed shut-off depth approved.

Well No. 1, shut off. T 1-94.

Shut-off approved.

Well No. 1, supplementary to drill. P 1-208.

Approved proposal to drill to a specified depth and test well by pumping for a certain period of time. Attention was called to the possibility of water-bearing formations between shut-off point and first oil-bearing formation which had been penetrated.

Well No. 1, shut off. T 1-138.

The production test witnessed failed to show that water had been satisfactorily shut off. Recommended that company take necessary steps to repair the well.

Well No. 2, commence drilling. P 1-253.

Recommended shut-off above first oil-bearing formation penetrated.

Well No. 2, supplementary to drill. P 1-267.

A representative visited the well to witness the first showing of oil reported. Approved shut-off depth given in the supplementary notice.

Well No. 2, shut off. T 1-181.

Shut-off approved.

Well No. 3, commence drilling. P 1-335.

Recommended shut off above first oil-bearing formation penetrated and that company secure samples of formation from rotary ditch or bit about every 10′ between a specified depth and shut-off point.

Well No. 3, supplementary to drill. P 1-349.

Approved proposed depth of water shut-off given in supplementary notice.

General Petroleum Company.

Cruz Well No. 1, commence drilling. P 1-318.

Recommended that company shut off water above first oil-bearing formation encountered in the well. The company was furnished with the depth at which the department estimated that oil-bearing formation should be found.

California Star Oil Company.

Nutt Well No. 1, commence drilling. P 1-237.

Recommended that the company shut off water above first oil-bearing formation penetrated in the well.

St. Helens Petroleum Company.

Well No. 1, commence drilling. P 1-363.

At the time this decision was written there were not sufficient data at hand to indicate the depth at which oil-bearing formation should be encountered. Recommended that company shut off water above first oil-bearing formation penetrated in the well.

Doheny-Pacific Petroleum Company.

Well No. 1, commence drilling. P 1-376.

Recommended that company shut off water above first oil-bearing formation penetrated in the well.

T. 1 S., R. 12 W.

SECTION 33.

Pan-American Petroleum Company.

Hellman Well No. 1, commence drilling. P 1-152.

Recommended that company shut off water above first formation, which was found to carry oil.

SECTION 35.

Pan-American Petroleum Company.

Tri-City Well No. 1, commence drilling. P 1-100.

There was not sufficient information at hand to indicate the depth at which water should be shut off. Recommended that company shut off water above the first oil-bearing penetrated in order that a proper test could be made.

Tri-City Well No. 1, supplementary to drill, P 1-170.

The company advised that the 12½″ casing failed to shut off water. A proposal from the company to attempt to force cement back of this casing was approved.

Tri-City Well No. 1, supplementary to drill. P 1-191.

Approved proposal from company to put in 10″ casing and drill well several feet deeper and make further tests relative to reported showing of oil. The department advised that such a test probably could not be satisfactorily made unless water above the sand was shut off.

Tri-City Well No. 1, shut off. T 1-82.

The results of the test showed that water was not shut off. Recommended that company determine the source of the water if possible.

Tri-City Well No. 1, supplementary to drill. P 1-195.

Approved proposal from the company to plug below the 12½″ casing to determine whether or not water was entering the well from back of this casing. It was the understanding of the department that the Riverside Portland Cement Company and the Baldwin Stocker Oil Estate, neighboring companies, agreed to pay the cost of this work.

Pan-American Petroleum Company.

Tri-City Well No. 1, shut off. T 1-96.

Upon request of the company the deputy supervisor was present at this well to witness the placing of a cement plug below the 12½″ casing.

Tri-City Well No. 1, shut off. T 1-112.

It was decided at a conference of neighboring operators with a representative of the company to put in additional cement. A proposal to do this was approved by the department.

Tri-City Well No. 1 test. P 1-246.

Approved proposal from the company to conduct certain bailing tests before and after drilling out the cement plug below the 12½″ casing.

Tri-City Well No. 1, shut off. T 1-147.

The results of bailing tests showed that the 12½″ casing failed to prevent water above the shut-off point from entering the well. Bailing tests made after the cement plug was drilled out indicated the possibility that water-bearing formation had been penetrated near the bottom of the well. Approval to continue drilling was given.

Rice Ranch Oil Company.

Well No. 1, commence drilling. P 1-151.

Recommended that the company shut off water above first oil-bearing formation penetrated in the well.

Well No. 1, shut off. T 1-152.

The results of the test showed that water was not shut off.

Well No. 1. supplementary to drill. P 1-261.

Approved proposal to continue drilling until a showing of oil was found and shut off water above same.

Well No. 1, shut off. T 1-244.

Shut-off approved.

Union Oil Company.

Valley View Well No. 1, commence drilling. P 1-150.

No recommendations relative to depth of water shut-off were made except that shut-off should be made above formation found to carry oil.

Baldwin-Stocker Oil Estates.

Well No. 3, commence drilling. P 1-197.

There was not sufficient information at hand when this decision was written to indicate the depth at which oil-bearing formation should be encountered.

SECTION 36.

Amalgamated Oil Co.

Connor Well No. 1, commence drilling. P 1-196.

Recommended shut-off above formation found to carry oil.

Connor Well No. 1, redrill. P 1-254.

Approved proposal to move derrick and rig and drill a second hole. No plugging was required in the first hole.

Amalgamated Oil Co.—Continued.

Connor Well No. 1, supplementary to drill. P 1-322.

Approved proposal to cement 12½″ casing at a depth of about 2150′.

Connor Well No. 1, supplementary to drill. P 1-358.

Approved proposal to continue drilling with 10″ casing and shut off water above first oil-bearing formation penetrated.

California Star Oil Co.

Comte Well No. 1, commence drilling. P 1-238.

Recommended shut-off above first oil-bearing formation penetrated in the well.

T. 2 S., R. 12 W., S.B.B. & M.

SECTION 1.

Standard Oil Co.

Baldwin Well No. 2, shut off. T 1-2.

Shut-off approved.

Baldwin Well No. 3, shut off. T 1-3.

Shut-off approved.

Baldwin Well No. 6, commence drilling. P 1-44.

Proposed shut-off depth approved.

Baldwin Well No. 6, shut off. T 1-31.

On account of the mixture of oil and water, three bailing tests were witnessed. The results of the last test indicated but did not definitely demonstrate that water was shut off. Approved proposal to complete well and make production test.

Baldwin Well No. 7, commence drilling. P 1-292.

Approved proposed shut-off depth.

Baldwin Well No. 7, shut off. T 1-239.

The results of the test did not conclusively prove that water was shut off. Approved proposal from company to make further tests.

Baldwin No. 7, shut off. T 1-243.

Test of water-shut was approved after hole had been cleaned out below the shoe of the water string and two additional tests witnessed.

Baldwin Well No. 8, commence drilling. P 1-80.

Approved proposed shut-off depth.

Baldwin Well No. 8, supplementary to drill. P 1-129.

After drilling into the oil sand the company filed a supplementary notice changing the original proposed shut-off point. The new proposal was approved.

Baldwin Well No. 8, shut off. T 1-58.

The results of two bailing tests witnessed by the department were not conclusive, in showing that water was shut off. Further tests were suggested.

Baldwin Well No. 8, supplementary to drill. P 1-164.

Approved proposal to bridge portion of well and attempt to force cement back of water string.

Baldwin Well No. 8, shut off. T 1-79.

The results of the test showed that water was not shut off. Recommended recementing or shut-off with another string of casing.

Baldwin Well No. 8, shut off. T 1-105.

The water string was recemented. The results of test showed that water was not shut off. Approved proposal to again recement.

Baldwin Well No. 8, shut off. T 1-123.

The results of test indicated that water was not shut off. Recommended further tests or that company file a proposal covering further work.

Baldwin Well No. 8, supplementary to drill. P 1-235.

Approved proposal to shut off lower joint of 12½″ casing and cement 10″ casing above the oil sand.

Standard Oil Co.—Continued.

Baldwin Well No. 8, shut off. T 1-150.

The results of the bailing test indicated that water was shut off. Approval to continue drilling was given. Recommended production test 30 days after completion.

Baldwin Well No. 9, commence drilling. P 1-107.

Approved proposed shut-off depth.

Baldwin Well No. 9, shut off. T 1-53.

The results of the test indicated that a complete shut-off had not been made. Oil stod at the surface when the test was witnessed. Approved proposal to make further tests.

Baldwin Well No. 9, supplementary to drill. P 1-163.

Approved proposal to bridge below and force cement back of the 12½″ casing.

Baldwin Well No. 9, shut off. T 1-93.

The results of the test showed water was not shut off. Approved proposal to recement the 12½″ casing.

Baldwin Well No. 9, shut off. T 1-118.

The results of the test showed that water was not shut off.

Baldwin Well No. 9, supplementary to drill. P 1-244.

Approved proposal to cement 10″ casing above the oil sand which had been penetrated.

Baldwin Well No. 9, shut off. T 1-167.

The results of the test showed that water was not shut off. Approved proposal to force cement back of the 10″ casing.

Baldwin Well No. 9, shut off. T 1-216.

The results of the test showed that water was not shut off.

Baldwin Well No. 9, plug and alter casing. P 1-331.

Approved proposal to put a 10′ plug of cement in the lower part of the 10″ casing, rip the casing above the plug and force cement out through the 10″ casing.

Baldwin Well No. 9, shut off. T 1-227.

This test was witnessed at the suggestion of the company. The test showed that the cement plug in the lower part of the 10″ casing prevented water from entering through the bottom of this casing.

Baldwin Well No. 9, shut off. T 1-232.

IThis test was witnessed at the suggestion of the company. The results of the test showed that a small amount of water entered the 10″ casing, probably through the perforations above the cement plug.

Baldwin Well No. 10, commence drilling. P 1-106.

Proposed shut-off depth approved.

Baldwin Well No. 10, recement. P 1-168.

Approved proposal to force cement back of the 12½″ casing.

Baldwin Well No. 10, deepen and recement. P 1-177.

Approved to cement 10″ casing above the first showing of oil encountered in the well.

Baldwin Well No. 10, shut off. T 1-136.

The results of the test showed that water was not shut off.

Baldwin Well No. 10, recement. P 1-263.

Approved proposal to force cement back of the 10″ casing.

Baldwin Well No. 10, shut off. T 1-165.

The results of the test showed that water was not shut off.

Baldwin Well No. 10, recement. P 1-283.

Approved proposal to cement 8¼″ casing at the depth given in the supplementary notice.

Baldwin Well No. 10, shut off. T 1-195.

Shut-off approved.

Baldwin Well No. 10, plug. P 1-353.

Approved proposal to plug a certain part of the lower portion of the well.

Standard Oil Co.—Continued.

Baldwin Well No. 11, commence drilling. P 1-134.

Approved proposed shut-off depth.

Baldwin Well No. 11, shut off. T 1-72.

Shut-off approved.

Baldwin Well No. 11, plug and alter casing. P 1-260.

Recommended certain shooting and plugging in the lower part of the well. Approved proposal to cement 10″ casing in case water was found to be entering the well from above the oil sand.

Baldwin Well No. 11, shut off. T 1-174.

This test was witnessed to determine the fluid level, after certain plugging had been done, previous to cementing the 10″ casing.

Baldwin Well No. 11, shut off. T 1-212.

Shut-off approved.

Baldwin Well No. 12. commence drilling. P 1-190.

Approved proposed shut-off depth.

Baldwin Well No. 12, redrill. P 1-348.

Approved proposal to move derrick and drill a second hole. No plugging was required in the first hole on account of the fact that this hole had not been drilled deep enough to penetrate oil-bearing formation.

Baldwin Well No. 13, commence drilling. P 1-257.

Approved proposed shut-off depth.

Baldwin Well No. 13, shut off. T 1-205.

Shut-off approved.

Baldwin Well No. 14, commenced drilling. P 1-285.

Approved proposed shut-off depth.

Baldwin Well No. 17, commence drilling. P 1-325.

Approved proposed shut-off depth. Recommended that company take samples of formation about every 10′ between a certain depth and the shut-off point.

Baldwin Well No. 18, commence drilling. P 1-334.

Approved proposed shut-off depth.

Union Oil Company.

La Merced Well No. 1, shut off. T 1-26.

Well passed for production test.

La Merced Well No. 1, shut off. T 1-240.

Shut-off approved.

La Merced Well No. 2, supplementary to drill. P 1-258.

Cement forced back of a string of casing which "froze," failed to shut off water. Approved proposal to continue drilling and cement casing above first oil sand.

La Merced Well No. 2, shut off. T 1-196.

Shut-off approved.

La Merced Well No. 3, shut off. T 1-86.

The test witnessed was not conclusive in showing that water was shut off. Further bailing tests were recommended.

La Merced Well No. 3, shut off. T 1-91.

The results of the last of several tests indicated but did not conclusively show that water was shut off. Approved proposal to drill about 350′ below shut-off point and make production test after completion.

La Merced Well No. 3, continue drilling. P 1-234.

Approved supplementary proposal to continue drilling below depth proposed by the company and approved in decision No. P 1-91.

La Merced Well No. 3, shut off. T 1-236.

Approval of test of water shut-off was not given. Recommend that company continue pumping pending further developments in the territory. Requested chemical analysis of water produced by the well.

Well No. 4, commence drilling. P 1-123.

Proposed shut-off depth approved.

Union Oil Company—Continued.

Well No. 4, shut off. T 1-102.

Shut-off approved.

Well No. 4, supplementary to drill. P 1-338.

Approved proposal to cut off oil string and set a packer near the shoe of the water string.

Well No. 4, test. P 1-366.

Approved proposal to continue pumping in an effort to diminish the water produced by the well.

La Merced Well No. 5, commence drilling. P 1-102.

Recommended shut-off at same stratigraphic depths as Well No. 1, in which shut-off was made above the first oil sand penetrated.

La Merced Well No. 5, supplementary to drill. P 1-131.

A proposal to drill below depth furnished by the company in the original notice was approved. Suggested drilling only to a specified depth before shutting off water.

La Merced Well No. 5, shut off. T 1-69.

Oil stood 40′ from the surface at time of the test. Approval to continue drilling was given with a production test to be witnessed after completion.

La Merced Well No. 5, shut off. T 1-241.

Water shut-off was approved after a production test was witnessed.

La Merced Well No. 6, commence drilling. P 1-155.

Proposed shut-off depth was approved.

La Merced Well No. 6, shut off. T 1-108.

Shut-off approved.

La Merced Well No. 9, commence drilling. P 1-324.

At the time the decision was written there was not sufficient information at hand to indicate the depth at which oil-bearing formation should be encountered. Recommended shut-off above first oil-bearing formation penetrated.

La Merced Well No. 10, commence drilling. P 1-323.

A decision similar to one for Well No. 9 was written for this well.

Petroleum Midway Company.

Germain Well No. 1, commence drilling. P 1-212.

Recommended shut-off above first oil-bearing formation penetrated in the well.

Germain Well No. 1, shut off. T 1-224.

The results of the test showed that water was not shut off. Suggested that the company force mud into the sand below the water string and make an effort to recement the 10″ casing.

SECTION 2.

Standard Oil Company.

Baldwin Well No. 4, supplementary to drill. P 1-61.

Recommended that the company cement 10′ lower than proposed in the supplementary notice.

Baldwin Well No. 4, test. P 1-126.

Approved proposal from the company to cement $8\frac{1}{4}$″ casing below the sand penetrated under the 10″ casing, providing certain tests showed that this sand was not oil bearing.

Baldwin Well No. 4, recement. P 1-136.

Report No. P 1-126 was superseded after the department obtained additional information relative to the sand penetrated below the 10″ casing.

Recommended that company shut off water above this sand.

Baldwin Well No. 4, supplementary to drill. P 1-161.

Approved proposal to shut off in shale "break" reported found in sand penetrated below the 10″ casing. Specifications for mudding and cementing were given.

Baldwin Well No. 4, alter casing. P 1-162.

Approved proposal to remove the upper portion of the 10″ casing.

Baldwin Well No. 4, shut off. T 1-89.

The results of the test indicated that water above the shut-off point had been prevented from passing to lower levels in the well. Approved proposal to clean out formation which had heaved up into the water string and test well for production.

Standard Oil Co.—Continued.

Baldwin Well No. 4, shut off. T 1-106.

The results of a bailing test for production were not conclusive on account of a sand plug which had heaved up into the water string to a point 630′ above the shoe. Approved proposal to clean out and put in an oil string.

Baldwin Well No. 4, shut off. T 1-121.

This completed the test of the productiveness of formations between the shut-off point and depth to which the well was drilled previous to cementing the 12½″ casing as the original water string.

Baldwin Well No. 4, plug. P 1-271.

Approved proposal to plug the lower portion of the well, after about 900′ had been drilled below the shut-off point.

Baldwin Well No. 20, commence drilling. P 1-364.

Recommended shut-off above first oil-bearing formation penetrated in the well and that samples of formation be taken about every 10′ between a given depth and the shut-off point.

Riverside Portland Cement Company.

Well No. 1, redrill. P 1-52.

Approved proposal to move derrick and drill a second hole. No plugging was required in the first hole.

Well No. 2, commence drilling. P 1-72.

At the time this decision was written there was not sufficient information at hand to indicate the depth at which water should be shut off. Requested weekly copy of the log of the well. Stated that recommendations relative to shut-off depth would be made at a later date.

Baldwin-Stocker Oil Estates.

Well No. 2, redrill. P 1-87.

Approved proposal to move derrick and drill a second hole. No plugging was required in the first hole.

Well No. 2, shut off. T 1-75.

Shut-off approved.

Well No. 2, supplementary to drill. P 1-252.

Approved proposal to cement 10″ casing above first showing of oil encountered.

Well No. 2, shut off. T 1-163.

The results of the test showed that water was not shut off.

Well No. 2, supplementary to drill. P 1-282.

Approved proposal to cement 8¼″ casing above first showing of oil encountered.

Well No. 2, supplementary to drill. P 1-328.

Approved proposal to put in 6¼″ casing with the lower joint perforated and make a pumping test. Recommended that company measure the amount of oil and amount of water produced each day.

Well No. 2, shut off. T 1-163.

Test indicated that water was not shut off by the cementing of the 10″ casing.

Petroleum Midway Company.

Howard & Smith Well No. 1, commence drilling. P 1-68.

Approved proposal to drill and recommended that water be shut off above first oil-bearing formation penetrated.

Howard & Smith Well No. 1, supplementary to drill. P 1-278.

Approved proposal to continue drilling in the manner outlined by the company.

Mulholland Well No. 1, commence drilling. P 1-305.

Approved proposal to drill, indicating depths at which samples should be taken, and recommended that the company shut off water above the first oil-bearing formation encountered.

General Petroleum Company.

Ralph Well No. 1, commence drilling. P 1-287.

The department furnished the company with an estimate of the depth at which oil-bearing formations should be encountered. Recommended shut-off above first oil-bearing formation penetrated.

Ralph Well No. 1, supplementary to drill. P 1-371.

Approved proposal to cement 12½″ casing at a given depth.

Union Oil Company.

La Merced Well No. 8, commence drilling. P 1-306.

Recommended that the company shut off water above first oil-bearing formation penetrated in the well.

SECTION 3.

Interstate Oil Company.

Well No. 1, drill. P 1-40.

Approved proposal to shut off water above first oil-bearing formation penetrated in the well.

Pan-American Petroleum Company.

Bicknell Well No. 1, commence drilling. P 1-101.

Approved proposal, and recommended that the company shut off water above formation found to carry oil.

WHITTIER FIELD.

T. 2 S., R. 11 W., S.B.B. & M.

SECTION 8.

Montebello Mascot Oil Co.

Well No. 1, commence drilling. P 1-207.

Approved proposal to drill. This department to be advised previous to shutting off water, provided an oil-bearing formation has been encountered.

SECTION 9.

Montebello Oil Syndicate.

Well No. 1, commence drilling. P 1-224.

Recommended that the company shut off water above oil-bearing formations which may be encountered.

SECTION 15.

Central Oil Company of Los Angeles.

Well No. 60, commence drilling. P 1-6.

The company proposed to drill, using three strings of casing, landing 12½" at the estimated depth of top of first productive oil or gas sand and second string at the estimated depth of second sand. Recommended that the company cement and test each string of casing landed in the well below a depth of 500′.

Well No. 60, shut off. T 1-57.

Approved shut-off with 12½" casing.

SECTION 22.

Central Oil Company of Los Angeles.

Well No. 31B, shut off. T 1-15.

Shut-off approved.

Well No. 46, deepen. P 1-38.

The proposal to deepen as outlined in the notice was approved.

Well No. 59, commence drilling. P 1-112.

The proposal to drill this well as outlined in the notice, supplemented by the verbal proposal of the superintendent was approved.

Standard Oil Company.

Savage Well No. 12, deepen. P 1-7.

The proposal to deepen was approved.

Savage Well No. 12, supplementary to deepen. P 1-46.

Approved proposal to cement 6¼" casing at the depth given in the notice, suggested that the company force mud into the oil and water sands above the proposed shut-off point and use sufficient cement to reach the shoe of the 8¼" casing.

Savage Well No. 12, recement. P 1-158.

Approved proposal to force cement back of the 6¼" casing.

Savage Well No. 12, shut off. T 1-84.

The results of the test showed that water was probably not shut off, suggested further bailing tests.

Savage Well No. 12, recement. P 1-194.

Approved proposal to force cement back of the 6¼" casing.

Standard Oil Co.—Continued.

Savage Well No. 12, shut off. T 1-128.

The results of the test showed that water was not shut off.

Savage Well No. 12, alter casing. P 1-243.

Approved proposal to plug the lower portion of the well and rip or shoot the 6¼″ casing and cement a new string of 6¼″ casing at about the same depth as formerly cemented.

Savage Well No. 12, shut off. T 1-252.

The results of the test showed that water was not shut off. Approved proposal to recement the 6¼″ casing.

Savage Well No. 14, shut off. T 1-7.

The results of the test showed that water above the shut-off point was not passing to lower levels in the well. Attention of the company was called to recommendation in a former report relative to the use of mud in drilling this well.

Savage Well No. 14, supplementary to drill. P 1-130.

Approved proposal to continue drilling and shut off water above first oil-bearing formation penetrated below the former shut-off point.

Savage Well No. 14, shut off. T 1-124.

A representative of the department witnessed the measurement of the depth of the well previous to plugging the lower portion. The department was not notified to witness a test of water shut off with the 10″ casing.

Savage Well No. 14, plug. P 1-236.

Approved proposal to plug the lower portion of the well in stages of from 50 to 60 feet.

Savage Well No. 14, shut off. T 1-148.

The result of a test and study of data furnished by the company indicated that the plugging work approved in P 1-236 was satisfactorily done.

Savage Well No. 15, commence drilling. P 1-290.

Approved proposal to cement 15½″ casing above the first oil zone providing the zone was encountered above a certain depth.

Savage Well No. 15, supplementary to drill. P 1-341.

A conditional approval to land 15½″ casing with heavy mud back of it instead of cement, to protect certain oil formations passed through, was given.

Savage Well No. 15, shut off. T 1-251.

The results of test showed that any water above the shut-off point was not passing to lower levels in the well.

Savage Well No. 16, commence drilling. P 1-33.

Recommended that the company shut off water between certain depths in order to protect an oil zone from which adjoining wells were producing. The attention of the company was directed to the protection of other oil sands which the well would probably penetrate.

Savage Well No. 16, shut off. T 1-62.

Shut-off approved.

Savage Well No. 16, plug. P 1-321.

Approved proposal to plug the lower portion of the well as outlined by the company.

Home Oil Co.

Well No. 12, deepen. P 1-36.

Approved proposal to deepen.

Well No. 19, redrill. P 1-1.

Recommended that the company plug the bottom of the well, indicating the depth at which plugging should be done.

SECTION 23.

Central Oil Company of Los Angeles.

Well No. 17B, deepen. P 1-110.

Approved proposal to deepen.

Well No. 18A, deepen. P 1-27.

Approved proposal to deepen in the manner outlined in the notice.

Central Oil Co. of Los Angeles—Continued.

Well No. 29A, abandon. P. 1-104.

Requested additional information as to the production of neighboring wells, and also information relative to sidetracked casing in the lower portion of the well.

Well No. 29A, supplementary to abandon. P 1-121.

Approved proposal to abandon, specifying redrilling, shooting and plugging operations necessary.

Well No. 32C, deepen. P 1-26.

Approved proposal to deepen in the manner outlined by the company.

Well No. 61, commence drilling. P 1-133.

Approved proposal to drill indicating probable depth at which oil-bearing formations should be penetrated.

SECTION 25.

Standard Oil Company.

M/W Well No. 53, commence drilling. P 1-122.

Approved proposal to drill in the manner outlined by the company.

M/W Well No. 53, shut off. T 1-131.

Water was not shut off by the 12½″ casing, which collapsed. The company filed a supplementary proposal covering further work at the well.

M/W Well No. 53, supplementary to drill. P 1-247.

Approved proposal to shut off water with 10″ casing at a depth as stated in original notice of intention to drill.

M/W Well No. 53, shut off. T 1-170.

Results of the test not conclusive. Recommended that the company drill the well so that a production test could be made of the first oil sand.

M/W Well No. 53, shut off. T 1-211.

Production test showed that the well produced considerable water. The company planned to continue producing from first oil zone. Recommended that the company notify the department when ready to make a second production test.

Fullerton Oil Co.

Well No. 1, deepen. P 1-193.

Approved proposal to deepen and prospect for lower oil-bearing formations.

Well No. 1, deepen. P 1-343.

Approved proposal to mud up first oil zone under pressure and cement a string of casing above second oil zone and produce from this zone.

Well No. 1, shut off. T 1-246.

Test of water shut off with 10″ casing satisfactory.

Well No. 4, commence drilling. P 1-327.

Approved proposal, giving estimated depth at which water should be shut off.

SECTION 26.

Standard Oil Co.

M/W Well No. 35, redrill. P 1-272.

Recommended certain ripping and plugging operations with pumping and fluid level tests to determine effectiveness of plugging. Advised delay of work at this well until certain information might be obtained from mudding and cementing operations at Well No. 36.

M/W Well No. 36, redrill. P 1-248.

Approval of proposal withheld pending further information. Recommended that the company furnish detailed outline of their plan to mud formations between the bottom of the 10″ and the cementing point of the 8¼″ casing, with estimated depth at which 8¼″ casing would be cemented.

M/W Well No. 36, supplementary to redrill. P 1-275.

Approved proposal to shut off the second oil zone. The department furnished the company with a detailed list of specifications of mudding the second oil zone and cementing casing below this zone in order that the third zone may be tested for production.

M/W Well No. 36, shut off. T 1-185.

Fluid level test was witnessed and a record of fluid level tests, as made by the company, obtained.

Standard Oil Co.—Continued.

M/W Well No. 37, redrill. P 1-273.

Recommendations covering work necessary towards mudding and shutting off first oil zone in order that production of clean oil could be obtained from the second oil zone, were made. These recommendations were worked out and agreed upon with officials of the company.

M/W Well No. 41, redrill. P 1-274.

The proposal to redrill was approved. The department recommended certain shooting and plugging operations in the lower portion of the well. A test of the effectiveness of the shut-off of the 6¼″ casing in preventing water from above the third oil zone from passing to lower levels in the well was also made. The attention of the company was directed to the fact that the first and second oil zones in this well probably had not been protected from water.

M/W Well No. 41, supplementary to redrill. P 1-374.

Upon advice from the company that two strings of tools were lost in the lower portion of the well, certain changes in former recommendations were made relative to shooting and plugging.

M/W Well No. 42, shut off. T 1-1.

Test of water shut-off satisfactory.

M/W Well No. 47, shut off. T 1-10.

Results of the test indicates that water above the shut-off point was not passing to lower levels in the well. The second oil zone was shut off. Shut-off depth not approved.

M/W Well No. 48, shut off. T 1-25.

Test of water shut-off satisfactory.

M/W Well No. 49, shut off. T 1-14.

Test of water shut-off satisfactory.

M/W Well No. 49, shut off. T 1-56.

Shut-off approved.

M/W Well No. 50, supplementary to drill. P 1-22.

A recommendation supplementing a former decision relative to shut-off depth was made.

M/W Well No. 50, shut off. T 1-45.

Tests as reported by the company and those witnessed by the department indicated that water was probably shut off by 10″ casing which has been recemented three times.

M/W Well No. 50, shut off. T 1-50.

Tests indicates that water was shut off by cementing of 10″ casing, but that water was encountered between the shoe of the 10″ casing and the bottom of the well. Recommended certain plugging and testing operations.

M/W Well No. 50, supplementary to drill. P 1-147.

Approved proposal to produce from second oil zone without producing from the first zone, providing each oil zone penetrated was protected from water. Recommended that the company thoroughly mud the well under pressure between the shut-off point above the second zone and the shoe of the 10″ and cement the 8¼″ with sufficient cement to reach up to the shoe of the 10″.

M/W Well No. 50, supplementary to drill. P 1-172.

Approved proposed depth of cementing 8¼″ casing.

M/W Well No. 50, shut off. T 1-76.

The company had prepared 215 cubic feet of mud-laden fluid, or an amount sufficient to fill about 30% of the 8¼″ water string. When the inspector visited the well to witness the mudding and cementing operations, it was found necessary to hold a pressure on the cement while it was in the 8¼″ casing in order to force mud into the formations. It would not have been necessary to do this if an amount of mud-laden fluid sufficient to fill the 8¼″ casing was available.

M/W Well No. 50, shut off. T 1-98.

Shut-off approved.

M/W Well No. 51, drill. P 1-20.

Approved proposal to drill, indicating depth at which water should be shut off.

Standard Oil Co.—Continued.

M/W Well No. 51, shut off. T 1-54.

Test unsatisfactory. Recommended that the company make further bailing or pumping tests to determine the amounts of oil and water entering the well and, if possible, the source of the water.

M/W Well No. 51, shut off. T 1-100.

Production test showed well to be producing a large percentage of water and emulsion. Approved oral proposal of company to clean out to original bottom, put in oil string and make further production test.

M/W Well No. 51, deepen. P 1-329.

Approved proposal to deepen and shut off the first oil zone. The department stated in this decision that the source of the water entering the well at that time was undetermined and that there was some doubt as to the effectiveness of the plan proposed by the company of mudding and cementing the well to exclude water from the first oil zone. Recommended that the company endeavor, in drilling, to locate probable water between the first and second oil zones; also specified requirements additional to those proposed by the company for the mudding and cementing operations.

M/W Well No. 52, commence drilling. P 1-65.

Proposed shut-off depth approved.

M/W Well No. 52, shut off. T 1-52.

Test of water shut-off unsatisfactory. Approved the oral proposal of the company to pump the well for a further test.

M/W Well No. 52, shut off. T 1-99.

Pumping test showed that the well produced considerable water and emulsion. Approved the oral proposal of the company to clean out to original bottom, put in an oil string and make further test of the well.

M/W Well No. 52, deepen. P 1-330.

Approved proposal to deepen. A decision similar to one for well No. M/W 51 written for this well.

M/W Well No. 54, commence drilling. P 1-128.

Approved proposal to drill indicating depths at which water should be shut off above first and second oil zones. Recommended that tests be made to locate probable water between the first and second oil zones.

M/W Well No. 54, shut off. T 1-151.

A test of shut-off with 12½" casing used as conductor casing was approved.

M/W Well No. 54, shut off. T 1-173.

10" casing was cemented above the first oil zone. The test of shut-off was unsatisfactory. Approved proposal to recement 10" casing at same depth.

M/W Well No. 54, shut off. T 1-213.

The test was unsatisfactory. Chemical analysis of water taken from the well before and after cementing the 10" casing indicate such waters to be different. The reports of bailing operations as conducted by the company show that small but constant amounts of oil and water entered the well.

M/W Well No. 54, deepen. P 1-332.

Approved proposal from the company to mud up and shut off the first oil zone and produce from the second zone. The attention of the company was called to the fact that the source of water entering the first zone had not been determined.

M/W Well No. 55, commence drilling. P 1-182.

Approved proposed depth for shutting off water.

M/W Well No. 55, shut off. T 1-191.

Test of water shut-off unsatisfactory. Approved oral proposal to recement at same depth.

M/W Well No. 55, shut off. T 1-217.

Test of water shut-off unsatisfactory. Recommended that the company take such steps as were necessary to protect oil-bearing formations below shut-off point.

M/W Well No. 56, commence drilling. P 1-181.

Approved proposal to drill, giving estimated depth at which water should be shut off.

Standard Oil Co.—Continued.

M/W Well No. 57, commence drilling. P 1-179.

Approved proposed depth for shutting off water.

M/W Well No. 57, shut off. T 1-184.

Test of water shut off unsatisfactory. Recommended that company make further bailing tests or take steps necessary to secure a shut-off.

M/W Well No. 57, shut off. T 1-221.

Test unsatisfactory. Recommended that the company file a written proposal covering necessary work at the well.

M/W Well No. 58, commence drilling. P 1-352.

Recommended that the company shut off water above the first oil-bearing formation encountered in the well below a depth of about 1900′.

M/W Well No. 59, commence drilling. P 1-336.

Recommended that the company shut off water above first oil-bearing formations encountered below a depth of about 1900′.

SALT LAKE FIELD.

T. 1 S., R. 14 W., S.B.B. & M.

SECTION 15.

Rancho La Brea Oil Co.

Well No. 41, shut off. T 1-141.

This well was deepened into a water sand below former producing oil sands. The production of adjoining wells indicated that damage from this well was ensuing. Several attempts made to plug the lower portion of the well failed to shut off the water. The department recommended that the company force mud-laden fluid into the water sand. The results of a subsequent test indicated that water was not entering the oil sands at this well. This was further borne out by the increase in the production of oil and the decrease in the production of water by neighboring wells.

SECTION 16.

Rancho La Brea Oil Co.

Well No. 65, redrill. P 1-304.

The notice to redrill stated that the well was producing 5 bbls. of oil and 100 bbls. of water, and that the company proposed to redrill to shut off water. The company was requested for information relative to plan of work at this well.

Well No. 65, supplementary to redrill. P 1-317.

Approved proposal to remove oil string above a depth of 1263′ and test out effectiveness of water string. If water string was found to be not effective, to remove same and cement a new water string at a depth of about 1215′.

Well No. 65, shut off. T 1-242.

Test of water shut-off approved.

Well No. 67, deepen. P 1-241.

Approved proposal to shoot and remove as much of the oil string (4½″ casing) as possible and deepen to 2300′.

Well No. 68, redrill. P 1-188.

Approved a proposal to redrill this well to original depth on account of oil string being broken off at a depth of 1700′.

SECTION 20.

Garbutt Oil Co.

Well No. 11, abandon. P 1-42.

The work of abandonment was not outlined. Recommendations were made giving depths at which shooting and plugging should be done.

Well No. 11, abandon. P 1-70. (Supplementary.)

Approved a proposal to shoot and remove 8¼″ casing above a depth of about 1140′ and use mud-laden fluid in order to redrill and plug the well between depths of 1265′ and 1300′.

Garbutt Oil Co.—Continued.

Well No. 5, supplementary to abandon. P 1-29.

The company proposed to abandon this well. Method of abandonment not outlined. Approval was given with certain recommendations as to shooting and plugging.

Well No. 1, supplementary to abandon. P 1-5.

Approved proposal to continue the work of abandonment of this well in the manner proposed by the company.

SECTION 28.

Rancho La Brea Oil Co.

Pitcher & Garbutt Well No. 71, redrill. P 1-56.

Approved a proposal to clean out and test well, and deepen, if necessary.

T. 1 S., R. 15 W., S.B.B. & M.

SECTION 25.

West Coast Oil Co.

Wolfskill Well No. 59, shut off. T 1-116.

The production of this well as reported by the company and witnessed by this department, showed that a small amount of water and oil was entering the well. It was stated in this decision that it would be satisfactory to the department for the company to continue producing or redrill the well to original depth.

PUENTE FIELD.

T. 2 S., R. 10 W., S.B.B. & M.

SECTION UNSURVEYED.

Petroleum Development Company.

Well No. 1, shut off. T 1-140.

Shut-off approved.

T. 2 S., R. 9 W., S.B.B. & M.

SECTION 9.

A. T. Currier.

Well No. 1, continue drilling. P 1-159.

The proposal to conduct certain tests following the plugging of the lower portion of the well and cementing of the 6¼" casing was approved.

Well No. 1, shut off. T 1-85.

The results of the test showed that water was not completely shut off. The owner of the well stated that he would file a proposal to plug and abandon the well.

Well No. 1, abandon. P 1-185.

The proposed plan to abandon was approved as submitted.

Well No. 1, shut off. T 1-168.

In view of the results obtained from a 10-day pumping test, the department did not require that certain plugging be done which had formerly been proposed by the owner of the well.

T. 2 S., R. 11 W., S.B.B. & M.

SECTION 11.

Shell Company of California.

Well No. 1, drill. P 1-262.

The company stated they proposed to drill in new territory and were unable to state definitely, at that time, at what depth they would encounter productive oil measures. It was planned to cement each string of casing and keep the department informed as work proceeded. This plan of drilling was approved.

OLINDA FIELD.

T. 3 S., R. 9 W., S.B.B. & M.

SECTION 7.

Union Oil Co.

Naranjal Well No. 8, shut-off depth. P 1-89.

Approval was given proposal contained in supplementary notice from company to shut off water at a depth of about 3100′.

Naranjal Well No. 8, supplementary to drill. P 1-307.

When a depth of 3248′ was reached in drilling, the company filed a notice proposing to drill to first oil-bearing formations and shut off water above same. This proposal was approved.

Naranjal Well No. 8, supplementary to drill. P 1-347.

Approval was given proposal to cement $8\frac{1}{4}''$ casing above sand encountered at a depth of 3313′. The department assumed that this sand carried oil.

Naranjal Well No. 8, shut off. T 1-253.

The test showed that 10′ of oil and 218′ of water entered the well in $27\frac{1}{2}$ hours. A representative of the company expressed an opinion that the water was return drilling water. Approved proposal to make further bailing tests.

Naranjal Well No. 9, commence drilling. P 1-201.

The company estimated that productive oil sand should be encountered at a depth of about 2600′ and proposed to shut off water at a depth of about 2500′. The department recommended shut-off at about 3000′.

Stearns Well No. 40, redrill. P 1-265.

The company proposed to redrill and shut off water on account of a collapsed water string. Additional information was requested relative to the new shut-off depth, as certain oil-bearing formations had been formerly shut off.

Stearns Well No. 55, commence drilling. P 1-302.

Further information was requested from the company relative to the proposed depth of water shut-off.

Stearns Well No. 55, drill. P 1-314.

Information requested in P 1-302 was furnished, giving additional data on adjoining wells. It was recommended that the company shut off water above the first oil-bearing formation encountered below a depth of 3000′.

SECTION 8.

Petroleum Development Co.

Well No. 10, deepen. P 1-303.

The company proposed to deepen the well from 664′ to about 1480′, stating that, if water was encountered between these depths, a supplementary notice would be filed outlining work necessary to protect the oil-bearing formation. Subsequent reports from the company show that the production of the well was increased from 3 bbls. of oil to about 80 bbls. of oil per day, as a result of deepening.

Well No. 41, alter casing. P 1-294.

Approved proposal to remove certain casing and shut off water by cementing $6\frac{1}{4}''$ casing about 20′ below the shoe of the former water string.

Well No. 74, shut off. T 1-40.

The results of former test of water shut-off did not conclusively show that water was shut off. A production test witnessed after completion of the well showed that the well was making about one-third water. It was recommended that the company make a 24-hour gauge of the production of certain adjoining wells and determine the amount of oil and water produced by them with the idea of finding out whether or not the well drilled deeper stratagraphically produced more water than those of less depth.

Well No. 76, plug bottom. P 1-103.

Approved proposal to rip lower portion of oil string and plug with cement.

Well No. 79, shut off. P 1-105.

Approved depth at which company proposed to shut off water.

Petroleum Development Co.—Continued.

Well No. 79, shut off. T 1-60.

Shut-off approved.

Well No. 80, shut off. T 1-23.

Test of water shut-off approved.

Well No. 80, alter casing. P 1-220.

Approved proposal to remove as much as possible of the 6¼" and 8¼" casings.

Well No. 81, drill. P 1-39.

Approved proposal to shut off water at depth given in notice of intention to commence drilling.

Well No. 81, shut off. T 1-34.

Test of water shut-off satisfactory.

Well No. 82, drill. P 1-138.

The company proposed to shut off water by landing 12½" casing at a point somewhere between 800′ and 1200′. It was recommended that the company shut off water at a depth of about 1050′.

Well No. 82, shut off. T 1-113.

Shut-off approved.

Well No. 83, commence drilling. P 1-232.

The company proposed to shut off water by landing 12½" casing in shale somewhere between depths of 800′ to 1200′. The department recommended that the company shut off water above the first productive formation, estimated at a depth of about 1000′.

Well No. 83, shut off. T 1-209.

Tests witnessed showed that water was not shut off. Verbal proposal from the superintendent to recement was approved.

Well No. 83, shut off. T 1-219.

The results of the test showed that water was not shut off. The company agreed to file a supplementary notice covering further work at the well.

Well No. 83, supplementary to drill. P 1-339.

Approved proposal to recement and, if unable to shut off the water, to perforate the 12½" casing and force cement through the perforations.

Well No. 84, commence drilling. P 1-296.

Approved depth at which the company proposed to shut off water.

Well No. 84, shut off. T 1-228.

Shut-off approved.

Well No. 85, commence drilling. P 1-326.

Shut-off depth approved.

West Coast Oil Company.

Well No. 63, shut off. T 1-120.

Shut-off satisfactory.

Well No. 68, supplementary to drill. P 1-301.

Approval was given supplementary proposal to shut off water at a depth of about 2290′. The log showed that oil was found in conglomerate encountered at a depth of 2300′.

Well No. 68, shut off. T 1-218.

Shut-off approved.

Well No. 69, commence drilling. P 1-369.

The estimated depth at which company proposed to shut off water was approved.

Well No. 74, shut off. T 1-155.

The results of several tests made, indicated that water was shut off. Approval to continue drilling was given. It was recommended that the company gauge the production of the well 30 days after completion and furnish the department with statement of results of the guage.

Olinda Land Co.

Well No. 2, deepen. P 1-2.

The proposal to deepen was approved. Information was furnished the company relative to a neighboring well, in which "bottom" water was probably encountered.

Olinda Land Co.—Continued.

Well No. 17, shut off. T 1-134.

The results of a production test showed that the well was making a small amount of water. The water condition of the well was not considered serious by the department. Recommendations were made to continue pumping.

Columbia Oil Producing Co.

Well No. 30, commence drilling. P 1-111.

The notice of intention to commence drilling stated that no water was expected in the drilling of this well. Recommendations were made by the department to protect all oil-bearing formations, from which neighboring wells were producing.

Union Oil Co.

Naranjal Well No. 6, shut off. T 1-18.

The results of measurement of depth to which well was open, as witnessed by the department, with metallic tape furnished by the company, indicated that hole was not open below the shoe of the water string. Approval of the shut-off was given, following measurements with a steel tape, which showed that the hole was open below the water string.

Naranjal Well No. 7, supplementary to drill. P 1-81.

It was recommended that the company shut off water about 600′ below the depth proposed.

Naranjal Well No. 7, supplementary to drill. P 1-203.

Approved proposal to shut off water at the depth given in the supplementary notice.

Naranjal Well No. 7, supplementary to drill. P 1-291.

The company advised that a small amount of water entered the well after cementing the 6¼″ casing. Recommended that the company prepare the well for test of water shut off.

Naranjal Well No. 7, shut off. T 1-186.

This test was witnessed to determine depth to top of fluid, character of fluid and depth to which hole was open.

Naranjal Well No. 7, shut off. T 1-192.

The well was pumped several days and, when rods and tubing were removed, the fluid was found at a depth of 1951′. No oil was noted in the production of the well or carried by formation removed by the bailer from bottom.

Naranjal Well No. 7, deepen, supplementary notice. P 1-309.

Approval was given supplementary proposal to rip lower portion of water string and plug same with cement up to point at which it could be removed and drill to first showing of oil and shut off water.

Naranjal Well No. 10, supplementary to drill. P 1-82.

Recommended that company shut off water at a depth of about 2450′. This decision supplemented a former decision in which it was recommended that company shut off at about 2050′. The company originally proposed to shut off at about 2400′.

Naranjal Well No. 10, redrill. P 1-144.

Approval of proposal to move rig and drill a new hole was given on account of mechanical trouble in first hole. Oil- or gas-bearing formations had not been encountered. No plugging was required.

Naranjal Well No. 10, supplementary to redrill. P 1-286.

Approved proposal to shut off water at the depth given in the supplementary notice.

Naranjal Well No. 11, commence drilling. P 1-77.

Recommended that the company shut off water about 350′ higher than proposed in the notice to commence drilling.

Naranjal Well No. 12, commence drilling. P 1-78.

Recommended that the company shut off water about 50′ lower than proposed.

SECTION 16.

Olinda Land Co.

Well No. 18, abandon. P 1-118.

Recommended that company shoot and plug well with cement between specified depths. Approved proposal to remove certain casing from the well.

Well No. 18, supplementary to abandon. P 1-167.

Approved proposal to remove as much of the 12½″ casing as possible.

Well No. 21, drill. P 1-315.

The following statement was made in this decision: "There is not sufficient information at hand to indicate the depth at which water should be shut off, or the depth at which oil-bearing formations should be encountered." Recommendation was made that the company shut off water above any oil-bearing formations encountered which were producing in wells in the vicinity.

SECTION 17.

Olinda Land Co.

Well No. 19, commence drilling. P 1-154.

The notice from the company stated that oil-bearing formations should be encountered at about 3000′ and proposed to shut off water at about 2900′. Study of peg model showing all wells in vicinity of this well indicated that water should be shut off at a depth of about 2850′. Recommendation was made that the company keep the department informed concerning character of formations encountered below a certain depth in order that a further study may be made relative to the proper depth at which water should be shut off.

Well No. 20, commence drilling. P 1-245.

The notice from the company stated that productive oil-bearing formations were expected at a depth of about 2600′ and proposed to shut off water at a depth of about 1500′. Attention of the company was called to the fact that the proposed shut-off point was about 900′ higher, stratagraphically, than proposed shut-off point in Well No. 10 on the same property.

Union Oil Co.

G. & L. Well No. 49, commence drilling. P 1-75.

Recommended that company shut off water about 300′ lower than depth proposed, in order to shut off below a water sand which was located above the oil sand in an adjoining well.

G. & L. Well No. 51, commence drilling. P 1-76.

Recommended that company shut off water about 275′ below depth proposed, for reason given in decision No. P 1-75, above.

G. & L. Well No. 52, commence drilling. P 1-337.

Recommended that company shut off above first oil-bearing formation encountered below a specified depth.

BREA CANYON FIELD.

T. 3 S., R. 10 W., S.B.B. & M.

SECTION 2.

Birch Oil Co.

Well No. 11, abandon. P 1-266.

Approved proposed method of abandoning.

Well No. 11, shut off. T 1-177.

The company found that they were unable to plug the lower portion of the well as planned. In view of the demonstration made by the company that certain casing prevented water from entering the well, this department approved a revised proposal which outlined plugging below and up into the 20″ casing.

Well No. 11, test cement plug. T 1-235.

This test was witnessed to locate the top and note the setting of cement plug referred to in revised proposal mentioned in T 1-177. The test proved satisfactory.

Well No. 12, redrill. P 1-59.

On September 20, 1917, this department recommended that the company shoot and plug with cement between depths of 4276′ and 4238′; also between 4090′

and 4045′, in order to shut off probable "bottom" water before carrying out proposal to remove the upper portions of the 4½″ and 6¼″ casings and perforating 8¼″ casing opposite oil sands formerly shut off. This well averaged about 3600 bbls. of water and 650 bbls. of oil previous to plugging lower portion as formerly recommended by the department.

Well No. 12, continue pumping. P 1-86.

On October 4, 1917, the company advised that they found that casing had collapsed so that tools would not go below a depth of 4100′, and proposed to continue pumping for a period of about 90 days.

Well No. 12, continue pumping. P 1-187.

On January 12, 1918, the company advised that pumping test was delayed on account of non-delivery of string of tubing. Approved proposal to continue pumping well in order to complete the production test.

Columbia Oil Producing Co.

Well No. 7, shut off. T 1-156.

Shut-off approved.

Well No. 8, commence drilling. P 1-202.

The notice to commence drilling stated that the company did not expect to encounter water in this well, and estimated that oil-bearing formations should be encountered at a depth of about 2000′. A letter supplementing the drilling notice stated that the company planned to cement 15½″ casing at about 750′. This proposal was approved.

Well No. 8, shut off. T 1-200.

Shut-off approved.

Brea Canyon Oil Co.

Well No. 28, redrill. P 1-365.

The notice to redrill did not give sufficient information relative to the condition of the well and work proposed. Approval to redrill was given after necessary data was received.

Well No. 30, redrill. P 1-16.

Approved proposal to move derrick and drill a new hole. The first hole was drilled to 500′ when the 10″ casing collapsed.

MISCELLANEOUS FIELDS.

T. 3 S., R. 9 W., S.B.B. & M.

Unsurveyed Section 36.

Richfield Field.

Standard Oil Co.

Kraemer Well No. 1, commence drilling. P 1-277.

Approved proposal, and recommended that the company shut off water above the first oil-bearing formation encountered.

T. 6 S., R. 10 W., S.B.B. & M.

Section 14.

Newport Field.

Standard Oil Co.

Irvine Well No. 1, commence drilling. P 1-308.

Approved proposal to drill and shut off water above first oil sand.

T. 4 S., R. 12 W., S.B.B. & M.

Section 19.

Dominguez Field.

Union Oil Co.

Bixby Well No. 1, abandon. P 1-284.

Approved proposal to abandon and remove as much casing as possible. In view of the operations of the Highland Development Co. to develop gas in this district, it was recommended that the company do such work as may be necessary to protect any gas-bearing formations which may have been encountered.

T. 4 S., R. 13 W., S.B.B. & M.

Rancho San Pedro.

Standard Oil Co.

Dominguez Well No 1, abandon. P 1-148.

The proposed method of abandonment was approved.

Highland Development Co.

Dominguez Well No. 1, supplementary to continue drilling. P 1-92.

The physical condition of the well caused the 6¼″ casing to be landed without cementing. Approved proposal to continue drilling, with the understanding that, in case oil-bearing formations were encountered, water will be shut off above them.

Dominguez Well No. 1, plug bottom and recement. P 1-200.

Approved the proposal of the company to perform certain shooting and plugging operations in order to test out a possible gas-bearing formation.

General Petroleum Corporation.

Carson Well No. 1, abandon. P 1-95.

Approved the proposal of the company to pull as much casing as possible and abandon. No plugging was required.

T. 2 S., R. 14 W., S.B.B. & M.

SECTION 20.

Inglewood Field.

Bartolo Oil Co.

Well No. 1, abandon. P 1-213.

Approved proposal to abandon. Certain shooting and plugging operations were recommended.

Well No. 1, test cement plug. T 1-122.

Tests as witnessed with information furnished by the company, indicated that a cement plug was placed against the walls of the well from a point 10′ below the shoe of the 8¼″ casing up 35′ into the 8¼″ casing, which fulfilled the requirements of the department as to plugging at that point.

Well No. 1, test cement plug. T 1-126.

Test as witnessed, with information furnished by the company, showed that the well was shot and cleaned out as recommended, but that the cement placed in the well did not remain in the position intended.

Well No. 1, supplementary to abandon. P 1-242.

Approved proposal to shoot and plug as outlined.

Well No. 1, test cement plug. T 1-132.

Test as witnessed, with information furnished by the company, showed that a cement plug was placed in the well between depths of 2725′ and 2750′, as recommended.

Well No. 1, test cement plug. T 1-139.

Test as witnessed, with information furnished by the company, indicated that a cement plug was placed in the well between depths of 2040′ and 2060′, as recommended. This work completed the required plugging of the well.

T. 1 S., R. 12 W., S.B.B. & M.

SECTION 19.

Jordan Crude Oil Co.

Well No. 1, commence drilling. P 1-83.

Approved proposal to drill, and recommended that the company cement each string of casing, except the oil string.

Well No. 1, shut off. T 1-164.

Test of water shut-off unsatisfactory. Approved proposal to recement

T. 1 S., R. 13 W., S.B.B. & M.
SECTION 25.

Amalgamated Oil Co.

Huntington Well No. 1, drill. P 1-15.

Approved proposal relative to depth at which 12½″ and 10″ casings should be cemented.

Huntington Well No. 1, shut off. T 1-42.

Shut-off approved.

T. 3 N., R. 15 W., S.B.B. & M.

SECTION 6.

NEWHALL FIELD.

Tunnel Petroleum Co.

Well No. 2, commence drilling. P 1-119.

Recommended that the company drill the well in the manner proposed, furnishing this department further information in case it became necessary to cement a second water string.

Well No. 2, supplementary to drill. P 1-140.

Approved proposal of the company to shut off water at a shallower depth than originally proposed in order that an oil sand near the surface could be tested for productiveness.

Well No. 2, shut off. T 1-70.

Water not shut off. A large amount of water had entered the well while standing for test. Source undetermined. Recommended bridging the bottom of the well and conducting further tests to determine, if possible, the source of the water.

Well No. 2, supplementary to drill. P 1-165.

Approved proposal of the company to clean out the well and make a pumping test. It was noted that oil-bearing formations, being tested for productiveness in this well, were not reported in the original log of well No. 1, adjoining, and were cased off without being tested in Well No. 1.

Well No. 2, supplementary to deepen. P 1-1000.

After exhaustive tests of the top oil zone, which tests proved that the zone was not commercially productive, approval was given to deepen the well and test out the oil zone from which well No. 1 was producing.

Well No. 2, shut off. T 1-1003.

Water shut off with 10″ casing. Test approved.

SECTION 7.

Standard Oil Co.

Well No. 22, Elsmere, commence drilling, P 1-17.

Approved proposed depth of water shut off.

Well No. 22, Elsmere, shut off. T 1-16.

Test showed water shut off and was approved as satisfactory.

Well No. 22, Elsmere, alter casing. P 1-116.

Method of redrilling to exclude, if possible, water which was being produced with the oil was approved.

Well No. 22, Elsmere, shut off. T 1-77.

Results of this test, together with tests conducted by the company and not witnessed by a representative from this department, indicate that several attempts to plug the bottom of the well after cementing the 8¼″ casing, failed to shut the water off or demonstrate its source. Recommended further bailing tests and requested notice of proposed new work.

Well No. 22, Elsmere, abandon. P 1-184.

Recommended certain work in plugging and abandoning the well.

SECTION 18.

Buick Oil Co.

Well No. 1, commence drilling. P 1-209.

Depth of water shut could not be determined in advance. Recommended that water be shut off, however, above any oil-bearing formations encountered in order that the productiveness of the formations might be determined.

Well No. 1, shut off. T 1-1000.

Water not shut off. Approved proposal to drive the casing in an attempt to exclude all water.

Well No. 1, redrill. P 1-1001.

Method of redrilling to sidetrack lost shoe joint to effect water shut-off was approved.

Well No. 1, shut off. T 1-1002.

Water shut off. Test approved as satisfactory.

Well No. 1, redrill. P 1-1005.

Approved proposal to redrill and shut off water at a lower depth in order to test out oil-bearing formations encountered below the proposed depth of shut-off.

T. 3 N., R. 16 W., S.B.B. & M.

SECTION 12.

E. A. & D. L. Clampitt.

Well No. 11, commence drilling. P 1-35.

Approved depth of water shut-off as proposed.

Well No. 12, commence drilling. P 1-149.

Proposed depth of shut-off was approved, providing oil formations were not encountered above the proposed depth.

SECTION 13.

E. A. Clampitt.

Well No. 3, abandon. P 1-37.

Recommended that the well be shot and plugged with cement in certain shale bodies during abandonment.

SECTION 16.

Standard Oil Co.

Well No. 6, Wiley, alter casing. P 1-226.

Approved proposal of the company to remove certain casing.

Well No. 14, Wiley, alter casing. P 1-227.

The proposal of the company to alter casing was approved.

Well No. 14, Wiley, alter casing. P. 1-228.

Approved company's proposal to remove portion of the casing with certain modifications.

Well No. 16, Wiley, alter casing. P 1-229.

The proposal to remove certain casing as outlined was approved.

Well No. 18, Wiley, alter casing. P 1-230.

Approved proposal to remove a portion of the casing.

Well No. 18, Wiley, redrill. P 1-1003.

Approved method of redrilling outlined by the company.

Well No. 18, Wiley, supplementary redrill. P 1-1006.

Due to changed conditions the supplementary proposal to redrill was approved.

Well No. 26, Wiley, alter casing. P 1-223.

The company's proposal to pull certain casing was satisfactory.

Well No. 27, Wiley, alter casing. P 1-221.

Approved proposal to remove portions of the casing providing the water string were not disturbed.

Well No. 29, Wiley, commence drilling. P 1-4.

Recommended depths at which water should be shut off in this well.

Standard Oil Co.—Continued.

Well No. 29, Wiley, shut off. P 1-8.

All water not excluded by landing casing. Recommended attempt be made to drive casing further and exclude all water.

Well No. 29, Wiley, supplementary to drill. P 1-14.

Being unable to drive casing further the company proposed to proceed with drilling. This proposal was approved.

Well No. 30, Wiley, commence drilling. P 1-63.

Approved proposed depth of water shut-off.

Well No. 30, Wiley, shut off. T 1-30.

Water not shut off. Recommended further work in attempt to exclude water.

Well No. 30, Wiley, shut off. T 1-35.

After driving the casing further water was shut off. Test satisfactory.

Well No. 30, Wiley, shut off. T 1-43.

Water was encountered below former shut-off, and cased off with second water string. Test approved as satisfactory.

Well No. 30, Wiley, alter casing. P 1-132.

Approved company's proposal to remove a portion of the casing from the well.

T. 3 N., R. 17 W., S.B.B. & M.

SECTION 2.

Standard Oil Co.

Well No. 21, P. C. O., plug. P 1-1002.

Recommended certain plugging to determine the source of water.

Well No. 21, P. C. O., abandon. P 1-1007.

Approved proposed method of abandonment.

Well No. 13, Cal. Star, alter casing. P 1-204.

The proposal to remove certain casing from the well was satisfactory.

Well No. 24, Cal. Star, alter casing. P 1-205.

Approved proposal to remove a portion of the casing from the well.

T. 4 N., R. 15 W., S.B.B. & M.

SECTION 31.

June Oil Co.

Well No. 1, commence drilling. P 1-1004.

Proposed depth of water shut-off was approved, providing oil formations were not encountered at a shallower depth, in which case a recommendation was made to bridge the well and shut off water above such formations.

T. 5 N., R. 16 W., S.B.B. & M.

SECTION 20.

Wheat and Defreest.

Well No. 1, commence drilling. P 1-157.

No estimate given by the company as to depth at which water should be encountered. Recommended close watch of formations penetrated and required a water shut-off above oil-bearing formations if encountered, in order that such formations might be properly tested.

CHAPTER IV.

VENTURA COUNTY.

By Irving V. Augur, Deputy Supervisor.

This district was formerly under the supervision of M. J. Kirwan, Deputy Supervisor of District No. 1, with offices in Los Angeles. The writer took charge of it in December, 1917.

It was found, upon taking charge, that the greatest need of the district, outside of routine tests and reports of well operations, was a more thorough understanding of underground conditions and structure in the various fields. It should be borne in mind that, unlike other districts in the state, the productive areas in Ventura County are scattered from one end of the county to the other, and that each producing area, of which there are approximately thirty-five, presents entirely different underground conditions, due to the individual structures upon which they are located.

For this reason it became necessary to study each individual area separately, and the best preliminary method to such study was apparently through the construction of peg models. Consequently attention was first paid to the larger producing areas, and the following peg models erected:

(1) South Mountain field.
(2) Bardsdale field—Bardsdale dome.
(3) Simi field.
(4) Ventura field.

In addition, the following are partly completed:

(1) Bardsdale field—Montebello dome.
(2) Pico Cañon field.

Since the construction of these models, many instances have occurred which have proved their value in anticipating the depths at which oil and water-bearing formations should be encountered and the proper depth of shut-off. Similar results have been obtained from the use of underground contour maps, but it has been found that the peg model is more easily and quickly understood by the majority of operators in the field and, if properly constructed, is as accurate as the contour map. In one instance the peg model proved more useful and accurate than cross-sections made by an engineer of one of the companies. In this case, the trouble lay in the proper correlation of certain cross-sections and the improper correlation in other sections, due to the impossibility of forming a mental picture of the substructure of the entire producing area.

Many companies operating on small production might increase the amount of production materially upon thorough analysis and knowledge of the structural conditions.

Logs of approximately 300 wells have been filed during the past year. The number of logs now on file for the district is more than double the number on file for the previous year. Out of the total number of logs listed for the county, only 65 per cent have so far been filed. This number, however, includes logs of a great many wells drilled and abandoned years ago. The logs of most of these old wells have been lost or destroyed. Graphic logs drawn number 311.

The total production of the county for the fiscal year ending July 1, 1918, amounted to 1,646,839 gross barrels of which 1,126,183 barrels was oil and 520,656 barrels was water. The proportion of water, therefore, for the county was 32 per cent. According to monthly production reports field in this office, the amount of oil produced during the fiscal year exceeded the amount of oil produced during the preceding year by about 230,000 barrels. There was also an increase in the water produced, amounting to approximately 265,000 barrels. The proportion of water produced with the oil for the county has risen from 27 per cent in 1916–1917 to 32 per cent in 1917–1918. The production per producing well per day, during the year, was 9.3 barrels of oil and 5 barrels of water, as against 7.9 barrels of oil and 3.1 barrels of water for the year previous.

Case of People of the State of California vs. Thomas A. Slocum.

During the year it became necessary to file complaint against Thomas A. Slocum, due to the failure of Slocum & Company to file logs of wells drilled on its property on Sec. 21, T. 4 N., R. 21 W., S. B. B. & M., Santa Paula Oil field, and for failure to file monthly production reports, notices of intention to drill new wells, notices of intention to abandon, redrill or deepen old wells, and for failure to notify the department for test of water shut-off before finishing and completing new wells. After repeated efforts, in writing, on the part of the state deputies to obtain the necessary information, and the entire disregard by the company of these requests, the above mentioned complaint was filed by the District Attorney of Ventura County. The defendant entered a demurrer, which was not sustained.

In the meantime, all of the desired records were prepared by the Company and submitted to this office. This department thereupon requested that the case be dismissed. This action is in line with a similar action brought against the Providential Oil Company, in District No. 1, and reported on pages 127 and 128 of the Second Annual Report (Bulletin No. 82).

Early History of Operations in Ventura County.

According to a report by Professor Silliman published in 1865, the presence of "fluid inflammable substance" was known in California as early as 1792. For many years the presence of petroleum on the surface was regarded as a detriment to the property because of the loss of live stock, which became mired in the pools of petroleum. Various reports indicate that the Indians in the region for many years used the petroleum occurring in the numerous seepages, in the same way as the Indians made use of the petroleum in the Pennsylvania oil fields previous to the development of oil. As early as 1854 there are records of the development of petroleum by Mexicans in this region. It is said that the Mexicans erected a still, with a copper worm, from which illuminating oil was made. In the year 1861, George S. Gilbert, a San Francisco man, erected a refinery for handling oil on a small scale. The refinery was built at what was afterwards known as Camp No. 1 of the California Development Company. The supply of oil came from natural wells or seepages, from which he is reported as having obtained 400 barrels of oil, without apparently diminishing the supply. The principal product of the refinery was illuminating oil. Gilbert's venture was considered a success until his plant was destroyed by fire. It was rebuilt, but a second time burned to the ground. The work was then taken up by the Philadelphia Oil Company, the Hayward Company, California Development Company, T. R. Brad, Stanford & Company, and others. In all, six camps were established by the California Development Company, located as follows:

Camp No. 1 was situated on the property of the Arnaz family, later known as the Ferguson place, in the southwest corner of the Rancho Ojai, on the old Ojai Creek Road. It was at this camp that oil operations were first started by Thomas R. Bard, upon his arrival from Pennsylvania. A house was built here for Mr. Bard, which in recent years has gone to ruin.

Camp No. 2 was situated close to the site now occupied by Camp Comfort, being about a mile south of the town of Ojai on the San Antonio Creek. Here one well was drilled on the property of P. T. Hobson.

Camp No. 3 was situated in the upper Ojai Valley.

Camp No. 4 was established on the Rancho Ojai in Pinkerton Cañon.

Camp No. 5 was situated near the head of Saisar (See-saw) Creek.

Camp No. 6 was near Camp No. 5. A number of wells which were drilled in this camp, and known as the "Astarta" wells, are now operated by the Pyramid Oil Company.

In a published report, made by S. F. Peckham in June, 1866, is found the statement that, during the course of ten months, 3000 bbl. of oil had been shipped from the Ventura oil fields. The greater part of this production came from tunnels and seepages, and the operators were conservatively advised to follow this line of development, although there were a few wells producing small amounts of oil at this time.

In 1877, the Standard Oil Company was operating on the Santa Ana Rancho, in the Cañada de Los Coches, and also in Santa Paula Creek, north of Santa Paula. In the same year, Adams, Thayer and Edwards were operating five tunnels, ten wells, and several springs in Adams Cañon; and Saxby, Davis and Remington were drilling near the eastern end of Sulphur Mountain.

Acknowledgments are made to Messrs. Gidney, Brooks and Sheridan's "History of Santa Barbara, San Luis Obispo, and Ventura Counties," and to Professor Silliman's "History of Recently Discovered Regions in California," for information on this subject.

With the advent of the Hardison & Stewart Oil Company, in 1883, operations in this district received a decided impetus. The principal developments were carried on in the Rancho Ex Mission, Sespe Creek, and later in Torrey Cañon.

The combination of Hardison, Stewart and Bard interests, by which the Union Oil Company was formed, developed further interest in active drilling operations, and placed the county first in point of production in the state in the early days. The Hardison and Stewart interests which entered the Union Oil Company were the Hardison & Stewart Oil Company and the Sespe Oil Company; the Bard interests being represented by the Torrey Cañon Oil Company. The organization of the Union Oil Company took place in 1890.

Subsequent to these early developments, the attention of oil men was diverted from the Ventura oil fields; but in recent years the attention of the oil prospector has reverted to this county. During the past two years a number of discoveries have added materially to the importance of this county in respect to production of oil. Among the new discoveries may be mentioned the South Mountain field, with a daily production of 600 bbl., and the Ventura field, with a daily production of approximately 200 bbl. of oil. The latter field includes two producing areas, the first being Ventura field proper, in which the Shell Company of California, the General Petroleum Corporation and State Consolidated Oil Company are represented, and the other area being about five miles south of Ojai, in which the New Mexico Oil Company and H. L. Hayes are operating.

As contrasted with the early developments, recent developments have been undertaken upon later ideas of geologic structure. The result has been a considerable increase in the amount of production from the county. A number of major structural features, beneath which lie formations which are oil-bearing in other parts of the county, still remain unprospected in this field. Quite recently these have been attracting considerable interest among oil operators, and it is probable that the production for the county will be increased.

For the sake of convenience, this district has been divided, and will be considered under the following named fields: Piru, Simi, Bardsdale, Sespe, South Mountain, Santa Paula, Ojai, Ventura and Miscellaneous.

Following is a table showing the number of wells listed, logs filed, graphic logs made, producing wells, average daily production of oil and water, and percentage of water, shown by fields.

TABLE I. Field Operations, Ventura County.

Field	Wells listed	Logs filed	Graphic logs	Number wells accounted for by production reports	Number wells actually producing, according to production reports	Total daily production		Average daily, per producing well		Per cent water
						Barrels oil	Barrels water	Barrels oil	Barrels water	
Piru	160	57	15	82	82	378.5	629.8	4.6	7.7	62.5
Simi	47	34	32	31	31	262.0	26.8	6.5	0.9	12.1
Bardsdale	173	164	155	129	129	1,507.6	125.5	12.4	0.9	7.2
Sespe	135	52	25	48	32	112.6	19.7	3.5	0.6	9.4
Santa Paula	166	122	32	39	35	94.8	44.8	2.7	1.3	33.4
South Mountain	21	13	11	10	9	591.0	.3	65.7	.03	.05
Ojai	129	88	25	44	33	210.4	408.1	6.4	12.4	66.0
Ventura	24	17	14	9	9	161.8	527.6	18.0	58.6	76.7
Miscellaneous	3	3	2	------	-----	--------	-------	--------	--------	-------
Totals	858	550	311	392	360	3,348.7	1,782.6	9.3	5.0	34.7

TABLE II. Summary of Notices Received and Reports Issued.

Field	New wells		Test of water shut-off		Deepen or redrill		Abandon		Supplementary	
	Notices	Decisions	Notices	Decisions	Notices	Decisions	Notices	Decisions	Notices	Decisions
Piru	1	2	2	2	1	1	10	10	1	4
Simi	15	11	17	14	5	4	1	1	11	10
Bardsdale	3	3	28	20	7	6	6	7	12	13
Sespe	1	1	6	5	1	2	2	2	2	3
South Mountain	12	9	17	18	11	11	1	1	4	3
Santa Paula	2	2	5	3	1	1	------	------	------	------
Ojai	3	3	4	4	2	2	2	2	3	3
Ventura	9	9	6	5	7	7	1	1	16	13
Miscellaneous	3	3	1	------	1	------	------	------	------	------
Totals	49	43	86	71	36	34	23	24	49	49

PIRU FIELD.

This field includes developed and undeveloped territory lying north and south of the Santa Clara River, adjacent to the town of Piru. Records show seven producing companies in this field during the past year; three companies being located north, and four south, of the Santa Clara River.

With one exception, each operating company in this field obtains its production from separate and distinct anticlinal folds, and the underground conditions governing the accumulation of oil and water are, therefore, distinct and noncommunicating. A feature of remarkable interest, from the standpoint of geology and the influence of underground structure upon accumulation, is evident upon the property being developed by the Diamond Valley Oil Company. Upon this property a plunging anticline from a westerly direction develops into a marked overturn tranverse to the axis of the anticline. It is possible that wells drilled in this area have penetrated one stratum from two to three times.

Water Conditions.

As outlined in the Second Annual Report, Bulletin No. 82, the water conditions in several producing areas in this field are serious. One company is producing 16 bbl. of oil and 211 bbl. of water per day, or 93 per cent water. It is possible, judging from surface evidence, that a large proportion of the water produced is surface water. An attempt should be made to locate the source of the water. Reference to Table I shows that there are 82 producing wells in this field, with an average daily production of 4.6 bbl. oil and 7.7 bbl. water per well, or 62.5 per cent water for the field. A comparison with the production figures given for last year shows a decrease, for this year, in production of oil of about one barrel per day per producing well and an increase of about one barrel of water per day. The total oil produced by the field for the fiscal year was 130,103 bbl. and the total water 189,959 barrels.

Recent Developments.

As shown by Table III, ten wells were abandoned during the fiscal year, and only one new well drilled. All wells abandoned were some distance from any productive area. This shows that the attempt to increase the productive area in this field has met with failure.

One well, during the process of abandonment, developed a considerable increase in oil, after ripping and endeavoring to remove the oil string, showing that oil had been encountered in an upper horizon and cased off during the preceding production period. This well now produces four times as much oil as formerly.

TABLE III. Piru Field.

Section, township, range	Company	New wells		Test of shut-off		Deepen, redrill, etc.		Abandon		Supplementary	
		Notices	Decisions	Notices	Decisions	Notices	Decisions	Notices	Decisions	Notices	Decisions
8-4 N.-18 W.	Diamond Valley	----	----	1	1	----	----	----	----	1	1
32-4 N.-18 W	Cameron Oil, Midway Supplementary	----	----	----	----	----	----	3	3	----	3
33-4 N.-18 W.	C. Victor Stephens	----	----	----	----	----	----	3	3	----	----
34-4 N.-18 W.	C. Victor Stephens	----	----	----	----	----	----	3	3	----	----
26-4 N. 18 W.	Beatty Oil and Development Company	1	2	1	1	1	1	----	----	----	----
1-3 N.-18 W.	Beatty Oil and Development Company	----	----	----	----	----	----	1	1	----	----
	Totals	1	2	2	2	1	1	10	10	1	4

SIMI FIELD.

Recent Developments.

The Simi field has been the scene of greater activity in drilling operations than any other field in Ventura County during the past year. Fifteen new wells were started during the year, and only one well was abandoned. During the abandonment of this well a considerable volume of gas was developed, and the well is now producing gas for use on the lease.

Of these new wells, thirteen were started by the Doheny-Pacific Petroleum Company, and two by the Santa Susana Oil Corporation. The drilling of these wells has practically defined the limits of production on the east and west ends of the field. The Simi anticline, from which the wells obtain their production, at this point is plunging at an angle of approximately 10° in a westerly direction. The south flank is nonproductive, due to an overturn or faulting of this side of the axis.

The two new wells of the Santa Susana Oil Corporation which were drilled in the eastern limits of the field failed to locate the shallower oil horizon, which is the most productive horizon in this field. The same condition is true of two new wells drilled by the Doheny-Pacific Petroleum Company on the western edge of the pool. Here, also, the portion of the oil horizon at the crest of the anticline is nonproductive.

Two wells are now drilling several miles to the west of the main field on what is called the Scarab Lease. The production obtained in this vicinity is derived from beds of the Sespe formation.

Through the courtesy of the Doheny-Pacific Petroleum Company a copy of an accurate map of this field was furnished this department. From the data, as shown on the map, a peg model to a scale of 100′

to 1″ was prepared by this department. This model pictures accurately the underground structure of the field, showing the zones of oil and water, and the distance of each zone from the surface.

The best indicator for a correlation was found to be the base of a sandstone series, called the Sespe formation. The Sespe formation is underlain by shales of Tejon Age, and it is from the Tejon formation that the production of oil is obtained. The top of the first productive oil horizon is approximately 200′ below the base of the Sespe sandstone, and the two formations in this region are apparently conformable.

The most important feature connected with the occurrence of petroleum in this area is the fact that the oil sands are lenticular. The oil sands do not appear in outcrop in the exposed oil series, as they rise to the surface farther east. Sands carrying heavy oil have been encountered near the base of the oil series. These sands, however, do not appear in outcrop.

Production and Water Conditions.

The total production of the field for the year amounted to 73,552 bbl. oil and 9788 bbl. water, or 12.1 per cent water. The highest proportion of water reported by any one company is 22 per cent. The average daily production per producing well amounts to 6.5 bbl. oil and .9 bbl. water. The average gravity of the oil is 33° Baumé.

On the basis of oil production per well, the Simi field ranks fourth in the county, being surpassed by the South Mountain, Bardsdale and Ventura fields, respectively.

Following is a table showing the notices received and reports issued for the field, and a list of the reports showing briefly the character of the work undertaken:

TABLE IV.

Simi Field.

Section, township, range	Company	New wells		Test of shut-off		Deepen, redrill, etc.		Abandon		Supplementary	
		Notices	Decisions	Notices	Decisions	Notices	Decisions	Notices	Decisions	Notices	Decisions
32-3 N.-18 W.	Doheny-Pacific Petroleum	1	1	3	2	1				1	1
34-3 N.-18 W.	Doheny-Pacific Petroleum	1									
35-3 N.-18 W.	Doheny-Pacific Petroleum	8	7	10	8	3	3	1	1	8	7
36-3 N.-18 W.	Doheny-Pacific Petroleum	3	1	1	1					1	1
36-3 N.-18 W.	Santa Susana Oil Corporation	2	2	3	3	1	1			1	1
	Totals	15	11	17	14	5	4	1	1	11	10

BARDSDALE FIELD.

The Bardsdale field includes two distinct anticlines and productive areas. In the eastern edge of the field, the Montebello anticline is being developed by the Montebello Oil Company, Calumet Oil Company, and Home Ranch Petroleum Company. The Bardsdale Dome, on the western edge of the field, is being developed by the Union Oil Company, Bardsdale Crude Oil Company and Bell Oil Company.

The daily production from the Montebello Dome amounts to 1514 bbl. of oil and 119.4 bbl. of water, or 7.3 per cent water. The daily production of the Bardsdale Dome amounts to 83.6 bbls. oil and 6.1 bbls. water, or 6.8 per cent water.

The production of the field as a whole, during the year, amounted to 579,136 bbl. oil and 45,188 bbl. water, or an average of 7.2 per cent water. A comparison with production figures in the Second Annual Report shows a decrease in amount of oil produced of approximately 1 bbl. per producing well per day, and an increase of .4 bbl. water per well during the same period. The decrease in the amount of oil produced is probably accounted for by the decrease in drilling operations. Three new wells have been drilled during the fiscal year, as compared with nine new wells the year before.

New Developments.

Reference to Table V shows that the three new wells in this field were drilled by the Calumet Oil Company, Montebello Oil Company and the Petroleum Midway Company, Ltd. The results of drilling by the first two named companies will not materially increase the productive area of the field. Should the new well being drilled by the Petroleum Midway Company, Ltd., prove productive, the proved acreage between the Montebello and Bardsdale domes will be largely increased.

During the past year six wells have been abandoned, as compared with three wells the year previous. Five of the wells abandoned were situated on the Bardsdale Dome, and the work of abandonment is a forerunner of the further abandonment of wells in the field on a larger scale, due to the extremely low production of wells on the edge of the field.

Construction of Peg Models.

In order to better understand underground conditions in this field, a peg model of the Bardsdale Dome has been completed by this department, and a peg model of the Montebello Dome is in process of construction. The peg model of the Bardsdale Dome shows a simple dome structure, the apex of the dome being approximately on the line between Sections 1 and 12, T. 3 N., R. 20 W., S.B.B. & M. The direction of the axis is almost east and west.

Extent of Productive Oil Horizons in the Bardsdale Dome.

From data as shown by the peg models, it is evident that most of the production up to the present time in the Bardsdale Dome is derived from an oil horizon approximately 400′ in thickness, and is obtained close to the apex of the fold. Wells on the edge of the field are now idle, or have been abandoned. It is noticeable that certain wells drilled in the western portion of the field have encountered and are producing from an oil horizon which overlies the main productive horizon and outcrops before reaching the apex of the fold. The oil is of a comparatively low gravity, and considerable water is produced with the oil, oil and water being frequently reported as occurring in the same sand. Several wells in this area have been deepened to the main productive horizon, increasing very materially the production and gravity of the oil.

Extent of Oil Horizons in the Montebello Dome.

The division of this area into three oil and two water zones has been described in the Second Annual Report, Bulletin No. 82. A third salt water zone was encountered below the third oil zone mentioned in this report. For a considerable time it has been recognized that the first oil zone in this area is not as extensive laterally as the second oil zone. The first zone is not productive east of the line between Sections 3 and 4, T. 3 N., R. 19 W., S.B.B. & M. The oil sands of this zone are encountered in the area, but have been found to contain no oil. It has been the policy of companies which have drilled through this top productive oil horizon to land a water string below both the oil horizon and the first salt water zone, and immediately above the second oil zone. This policy may be found, in the future, to be responsible for considerable water trouble in the first oil horizon, which is productive in wells to the west. It may, at some time, be necessary, on account of the prohibitive amounts of water, to change the depth of water shut-off in wells which have penetrated both the first oil and first water horizons, or to gradually abandon the shallow wells now producing from the top oil zone. The amount of water entering the top oil zone has increased 23 per cent from November, 1916, up to June, 1918. A definite policy should be adopted in drilling new wells in this area, looking towards the mudding and protection of the top oil zone in all new wells drilled.

Not only is the first oil zone nonproductive in the eastern portion of this field, but several hundred feet at the top of the second zone are nonproductive. Original plans for shutting off water in this area called for a uniform statigraphic shut-off above the second oil zone, irrespective of the productiveness or nonproductiveness of the top portion of this zone. Recently the tendency has been to carry water from the first salt water zone into the nonproductive portion of the second oil zone.

The results of such a policy, if continued, may introduce water trouble, which may not for the time being be noticeable in adjoining wells. This policy should be discouraged unless the portion of the oil zone to be cased off has been fully protected from top water.

Another feature of interest is the discovery, on the eastern edge of the field, of the existence of probable edge water in the lower portion of the second oil zone. Several wells having encountered this probable edge water have been plugged back ostensibly as having encountered the third salt water zone. One well which encountered this probable edge water has been deepened farther into the oil zone to obtain greater production, and is now producing considerable water from the edge water sand or sands. This condition must be anticipated in future drilling in this area and steps taken to prevent the infiltration of water into the oil sands in any well to be drilled or already completed. A co-operative spirit must prevail in all operations in order that the water problem may be handled efficiently and the danger from infiltration avoided.

At the present time water conditions are not serious, but the source of possible water trouble must be recognized and future operations be guided by definite protective policies.

Following is a summary of notices received and reports rendered during the fiscal year:

TABLE V.

Bardsdale Field.

Section, township, range	Company	New wells		Test of shut-off		Deepen, redrill, etc.		Abandon		Supplementary	
		Notices	Decisions	Notices	Decisions	Notices	Decisions	Notices	Decisions	Notices	Decisions
3-3 N.-19 W.	Home Ranch Petroleum Company	----	----	----	1	1	1	----	----	----	----
3-3 N.-19 W.	Calumet Oil	1	1	2	2	----	----	----	----	----	----
4-3 N.-19 W.	Montebello Oil Company	1	1	23	15	6	5	----	----	10	10
5-3 N.-19 W.	Montebello Oil Company	----	----	1	----	----	----	1	1	----	1
6-3 N.-19 W.	Montebello Oil Company	----	----	----	----	----	----	2	2	1	----
5-3 N.-19 W.	Petroleum Midway, Ltd.	1	1	1	----	----	----	----	----	----	----
12-3 N.-20 W.	Union Oil Company of California	----	----	1	1	----	----	----	----	----	----
12-3 N.-20 W.	Wm. Z. McDonald	----	----	----	1	----	----	3	4	1	2
	Totals	3	3	28	20	7	6	6	7	12	13

SESPE FIELD.

This field includes all the territory adjacent to the Big and Little Sespe creeks. The producing areas are located mainly in Little Sespe Creek and its tributaries.

The principal operators in the Sespe field are the Big Sespe Oil Company, Kentuck Lease, Sudden & Emslie, Mutual Oil Company, Rose

Oil Company, Union Oil Company and White Star Oil Company. Many of the wells located in the upper portion of the Little Sespe Creek were among the first producing wells in Ventura County. A great many of the wells have been abandoned on account of small production.

On October 2, 1917, a disastrous fire swept over the northern portion of the field, which destroyed many rigs, houses and tanks. Of the twenty-six rigs so destroyed, only ten have been rebuilt. Subsequent to the fire, the production was approximately 1700 bbl. per month, of which only about 1100 bbl. per month have been recovered.

New Developments.

Only one well was started during the past year. This well is on the property of the Big Sespe Oil Lease, in the group of wells which mark the northern limit of productive territory in the Big Sespe Creek. Two wells have been abandoned.

Very little development has taken place in this field during the fiscal year, and but slight, if any, progress has been made, due principally to the forest fire which laid waste such a large portion of the northern part of the field.

Production and Water Conditions.

A comparison of the present production figures and those issued last year shows the daily production of oil per producing well to be practically the same. A considerable *decline* in water is shown, however; and no area of excessive water production was reported. The total amount of oil produced by the field was 30,845 bbl., and the total amount of water 6165 bbl., the water production being 9.4 per cent of the gross production.

Future Developments.

As almost all of the productive areas, and the prospective productive areas, in this field are located some distance from shipping points, and the only road to the district is a wagon road which is practically closed to travel during the winter months, and, furthermore, since the production obtained is small, and the producing areas and folds are considerably limited, further extensive developments during the coming year are not anticipated. Future reports of this district will undoubtedly show a decline in operations undertaken and production, rather than an increase.

Following is a table showing the number of notices received and decisions rendered and a list of decisions for the field:

TABLE VI.
Sespe Field.

Section, township, range	Company	New wells		Test of shut-off		Deepen, redrill, etc.		Abandon		Supplementary	
		Notices	Decisions	Notices	Decisions	Notices	Decisions	Notices	Decisions	Notices	Decisions
6-4 N.-19 W.	Sudden & Emslie	----	----	----	1	1	2	1	1	1	1
20-4 N.-19 W.	Oak Ridge Oil Company	----	----	----	----	----	----	1	1	1	2
1-4 N.-20 W.	Kentuck Lease	----	----	1	1	----	----	----	----	----	----
33-5 N.-19 W.	White Star Oil	----	----	2	1	----	----	----	----	----	----
23-5 N.-20 W.	Big Sespe Oil Lease	1	1	3	2	----	----	----	----	----	----
	Totals	1	1	6	5	1	2	2	2	2	3

SOUTH MOUNTAIN FIELD.

General Description.

The most important developments in the county during the fiscal year have taken place in the South Mountain field.

Since the completion of the first well in this field in April, 1916, twenty-one additional wells have been completed or are drilling, and the field has risen from fifth place to second place in point of production in the county. During the fiscal year the daily production from this field amounted to 591 bbl. of oil and .3 bbl. of water daily, as compared with 134 bbl. oil and .4 bbl. water for the previous year. The daily production per producing wells was 65.7 bbl. of oil, as compared with 6.5 bbl. of oil per producing well in the Bardsdale field, which has the largest total production of all other fields in the district. Such a comparison gives an idea of the production which may be expected of this field in the near future.

A large proportion of the production was obtained from wells which flowed oil while drilling. If the present rate of progress obtains for the coming year, it is not improbable that the field will produce approximately two-thirds as much oil as the Bardsdale field.

Up to this time no water-bearing formations have been discovered above the top of the first oil horizon. Drilling operations are, therefore, much simpler than under the conditions encountered in the Montebello Dome of the Bardsdale field, where salt water zones have been reported.

Geologic Formations and Structure.

The structure of this field is anticlinal. It is very similar to the Bardsdale Dome, of which it is a continuation to the west. The larger production is obtained at the apex of the fold, which plunges both easterly and westerly. The dip on the north flank is considerably steeper than that on the south flank. There is a possibility that the dome is slightly overturned to the north. From surface indications it appears that the axis of the anticline, as it plunges westward, separates into two axes, which diverge and finally disappear under the floor of the Santa Clara River Valley, south of the town of Santa Paula. The southerly branch of the anticline may turn towards the southwest, parallel with the foothills on the south side of the river.

Recent drilling in the productive area in this field has been confined solely to beds of the Sespe formation. Wells which were started in these beds have been drilled to a depth of 3000′ without encountering the Tejon shales, which probably underlie this area.

Beds of later age than the Sespe, which in this area include the Vaqueros, Puente and Fernando, have been eroded from the apex of the fold and swing around the plunging end of the axis several miles to the west of the dome. They are, therefore, unimportant as oil producing formations in the present producing area.

New Developments.

At the present time, in this field, there are four wells drilling, which will no doubt determine the extensiveness of the pool along the axis of the anticline in an easterly and westerly direction.

Comparing the structure of this field with the structure of the Bardsdale and Montebello domes, which are a natural extension of this anticline towards the east, it seems probable that the limits of the production of the field will be much more restricted than has been generally conceded by the operators. It is very probable, as mentioned above, that the first oil horizon is less extensive than the lower oil measures, and it is also possible that edge water will be found in various sands of the lower oil formations. The productive area will probably not exceed one and a half miles along the axis and one-half mile transverse to the axis at the apex of the dome.

In an attempt to develop formations which at one time carried oil and outcrop near the crest of the mountain, one well was drilled very close to the axis of the syncline which parallels the South Mountain Dome. It is claimed that the oil sand which showed on the surface, and which is probably of Puente Age, was encountered at a depth of about 1500′, but that the sand did not carry oil at this point, and the well was therefore abandoned.

Construction of Peg Models.

In order to better study the underground structure and drilling conditions, a peg model has been constructed by this department. In this area sand and shale frequently grade one into the other in comparatively short distances, and the coloring of the bands, so characteristic of Sespe formation, is not continuous throughout the stratum. Therefore it is difficult to make accurate correlation.

Table VII shows the proposals received and reports issued for the fiscal year:

TABLE VII.

South Mountain Field.

Section, township, range	Company	New wells		Test of shut-off		Deepen, redrill, etc.		Abandon		Supplementary	
		Notices	Decisions	Notices	Decisions	Notices	Decisions	Notices	Decisions	Notices	Decisions
17-3 N.-20 W.	The United Oil	----	----	2	4	1	1	----	----	1	1
18-3 N.-20 W.	Santa Paula Oil Association	1	----	----	----	----	----	----	----	----	----
18-3 N.-20 W.	Santa Paula Oil Company	2	2	1	1	4	4	----	----	----	----
18-3 N.-20 W.	Oak Ridge Oil Company	3	2	6	6	4	4	----	----	1	1
13-3 N.-21 W.	Oak Ridge Oil Company	1	1	5	5	2	2	----	----	1	----
14-3 N.-21 W.	Oak Ridge Oil Company	3	2	----	----	----	----	----	----	----	----
29-3 N.-20 W.	Hondo Oil Company	1	1	1	1	----	----	1	1	----	---
13-3 N.-21 W.	H. P. Oates	1	1	----	----	----	----	----	----	----	----
13-3 N.-21 W.	Union Oil Company of California	----	----	2	1	----	----	----	----	1	1
	Totals	12	9	17	18	11	11	1	1	4	3

SANTA PAULA FIELD.

Recent Developments.

There has been less activity in this field during the past year than in any other field in the district. An extension of the field towards the west is a possibility. Similar areas further west along the Fernando-Monterey contact, and located in the Ventura field, have recently received a good deal of attention and have developed a considerable quantity of oil.

Production and Water Conditions.

The production for wells in this field is less than any field in this district, amounting to 2.7 bbl. oil and 1.3 bbl. water per producing well per day, or an average of 34.3 per cent water. The production of the field shows a decrease of approximately one-half barrel of oil per day, as compared with the production of the previous year, the amount of water being practically the same.

The following table gives a record of proposals received and reports issued for the fiscal year:

TABLE VIII.

Santa Paula Field.

Section, township, range	Company	New wells		Test of shut-off		Deepen, redrill, etc.		Abandon		Supplementary	
		Notices	Decisions	Notices	Decisions	Notices	Decisions	Notices	Decisions	Notices	Decisions
18-4 N.-20 W.	Timber Canyon Syndicate	----	----	2	1	1	1	----	----	----	----
20-4 N.-20 W.	Santa Clara Oil and Developm nt	----	----	2	1	----	----	----	----	----	----
29-4 N.-20 W.	Mausard & Jameson	1	1	----	----	----	----	----	----	----	----
22-4 N.-21 W.	American Ventura Oil	----	----	1	1	----	----	----	----	----	----
25-4 N.-22 W.	Saltmarsh Canyon Oil	1	1	----	----	----	----	----	----	----	----
	Totals	2	2	5	3	1	1	----	----	----	----

OJAI FIELD.

Recent Developments.

Since the acquisition of extensive property, formerly owned by the Bard Oil and Asphalt Company, in this field, by the Pan-American Petroleum Company, considerable new developments have been in progress during the fiscal year. Three new wells were started by this company, two of them being located in producing territory, the third seeking to open up new areas about two miles west of the main lease. The latter well, known as "Pinkerton" No. 1, is drilling close to, and south of, prolific seepages which occur at the outcrop of oil strata, which at this point cross Pinkerton Cañon and dip 65° toward the south. The completion of a commercially productive well in this locality would undoubtedly prove up a large portion of territory in the western and southern part of the field.

Great importance is attached to the completion of a well drilled by the Great Republic Oil and Paint Company, near the south line of Sec. 8, T. 4 N., R. 21 W., S.B.B. & M. This well was drilled only a few hundred feet from a well on this property drilled in 1902 by the Northern Oil Company, which well was carried to a depth of 1460′ and was producing six barrels of oil per day nine years later.

Both of these wells enter the Tejon formation at the surface some distance north of the fault which marks the southern limit of the Santa Paula ridge and which has been considered as defining the northern limit of producing territory. The Tejon shales at this point are dipping approximately 45° north and gradually assume an almost vertical position before reaching the fault to the south. These wells are apparently the only wells which have obtained production directly from the Tejon formation in this field. The presence of oil in this locality where the oil bearing formations, from which the wells produce, outcrop a short distance to the south, and where no seepages occur, may be due to one of the following reasons:

1. The hardness and compactness of the Tejon oil sands and shales may prevent the escape of oil and gas where these beds outcrop a short distance south of the wells.

2. The dip of the fault plane may be a low angle, and the oil may be derived from an accumulation in the fault zone and a gradual transmission into the overlying beds of Tejcn formation. Several factors may be mentioned in support of this theory:

(*a*) At a depth of about 1700 feet in the new well of the Great Republic Oil and Paint Company (well No. 2), the drill passed through Tejon shales and entered a stratum of very heavy oil or asphaltum. The productive oil above is of medium gravity.

(*b*) One mile west of the Great Republic property, a well drilled by the Hill Top Oil Company started at the surface in the Tejon formation, and at a depth of 1000 feet entered red rock and softer formations, which apparently belong to the Sespe age and normally lie above the Tejon beds. This well attempted to produce very heavy oil from the so-called Sespe beds.

The presence of asphaltum in the first mentioned well, and Sespe beds in the latter well, would indicate a northward dip of the fault plane between the Sespe and Tejon formation at this point. Under such conditions it is possible that oil has accumulated in the zone of faulting and has permeated fractured shale of Tejon age directly above the fault contact. At any rate, the presence of oil in the Tejon formation, under such conditions, opens up possibilities in an extensive belt of Tejon running east and west and bordering the fault which is the principal feature of structure on the north side of this field. This region certainly warrants detailed study of underground and surface structure. In only one other field in the district—the Simi field—is the Tejon formation known to be productive, and production in this case is obtained from the upper portion of this formation, as contrasted with the middle or lower Tejon which is productive in the Ojai field.

Due to the hard character of the Tejon strata, in contrast to the younger beds of Sespe and Vaqueros, which contain the main productive horizons in the county, it is not to be expected that the production from the older beds would be as rapid. It has been proven, however, that wells drilled into this formation produce oil on a commercial scale for a much longer period than wells producing from the softer formations, and it is therefore possible that an investment in drilling in this area would prove profitable.

Numerous attempts have been made to obtain production in the region of Sulphur Mountain, the southern and western limits of the field. Up to the present time all efforts to obtain commercial production have met with failure. The presence of numerous large seepages will undoubtedly attract new operators to this region, especially since the advent of new oil fields recently developed at the western end of Sulphur Mountain, near the Ventura River. The possibilities of this region can not now be estimated.

Production and Water Conditions.

Production for the field, as reported for the fiscal year, amounts to 64,971 bbl. of oil and 148,892 bbl. of water. This is a daily average of 210.4 bbl. of oil and 408.1 bbl. of water for the field, or 6.4 per cent of oil and 12.4 bbl. of water per producing well per day, the proportion of water being 62 per cent. The production of oil reported exceeds production for the previous year by approximately 50 bbl. per day for the field.

Several wells of one of the larger companies are reported to be making from 90 to 95 per cent water. The condition of these wells should be investigated immediately, the source of the water located, and the water excluded before further damage occurs to the oil measures.

TABLE IX.

Ojai Field.

Section, township, range	Company	New wells		Test of shut-off		Deepen, redrill, etc.		Abandon		Supplementary	
		Notices	Decisions	Notices	Decisions	Notices	Decisions	Notices	Decisions	Notices	Decisions
7-4 N.-21 W.	Hill Top Oil	---	---	---	---	---	---	1	1	---	---
7-4 N.-21 W.	Interstate Oil	---	---	1	1	1	1	---	---	2	2
8-4 N.-21 W.	Great Republic Oil and Paint	---	---	1	1	---	---	---	---	---	---
17-4 N.-21 W.	Capital Crude Oil	---	---	1	1	---	---	---	---	---	---
11-4 N.-22 W.	Pan-American Petroleum	1	1	---	---	---	---	---	---	1	1
14-4 N.-22 W.	Pan-American Petroleum	1	1	---	---	1	1	1	1	---	---
15-4 N.-22 W.	Pan-American Petroleum	1	1	---	---	---	---	---	---	---	---
12-4 N.-22 W.	Santa Maria Crude Oil	---	---	1	1	---	---	---	---	---	---
	Totals	3	3	4	4	2	2	2	2	3	3

VENTURA FIELD.

Developments of great importance have taken place during the past year in this field, and undoubtedly greater interest has been aroused in the prospects of this field than in any other field in the county.

Two important additions have been made to the proved area of this field, and there are prospects for considerable increase in production for the county. Production has been obtained from two areas in the field. The first mentioned area is known as the Ventura field proper; the latter area lies in the western extension of Sulphur Mountain, where this range is cut by the Ventura River.

SOUTHERN PORTION OF THE FIELD.

In that portion of the field located on the Ventura anticline, only one well was started during the past year. Six other wells, however, which were reported as having commenced drilling in the year previous, are still uncompleted, and are therefore to be considered as new wells. Operating companies in this district include the Shell Company of California, with four drilling wells, the State Consolidated Oil Company, with three drilling wells and one completed well, and the General Petroleum Corporation, with two wells drilling and one well completed.

Geology.

All the wells drilling in this area are apparently located close to the axis of the Ventura anticline, which crosses the Ventura River about two and a half miles north of the city of Ventura. Drilling starts in beds of Fernando age, and the deepest well so far drilled (4000′) has probably not yet penetrated the entire series. It may be possible, however, that the lowest formations penetrated should be classified with the Puente formation instead of the Fernando. Definite evidence as to the exact age of such formation is lacking. One company estimates the original thickness of Fernando beds in this region as being approximately 8000′.

The anticline upon which these wells are located can be traced on the surface for a distance of about twelve miles, the easterly end plunging under the Santa Clara River Valley, north of Saticoy, and the westerly end disappearing in the Pacific Ocean close to Pitas Point. The fold is mantled by the Fernando formation throughout its entire extent, typical species of the fauna of this formation being found at numerous places. The structure of the anticline, where it is cut by the Ventura River, is revealed as a simple fold, striking almost at right angles to the river, dipping uniformly on the north and south flanks at an angle of about 45° and plunging slightly towards the west.

The formations penetrated by the drill are essentially soft sands, blue and brown shales, and sandy shales. Large quantities of salt water, usually accompanied by an inflammable gas, are encountered in drilling. The water usually flows from wells in the Ventura River Valley after drilling below a depth of about 1000′. In only one well in this area has the salt water failed to flow from the well. This is probably due to differences in elevation of approximately 350′, which is roughly equivalent to an added pressure of about 150 pounds per square inch.

Character of Oil Formations.

According to popular opinion, two oil zones have been encountered in this area to date. An upper zone, which produces oil of 56° Baumé gravity, is separated by several hundred feet from a lower oil of 30°. It seems more likely that the two so-called zones are not separate and distinct, but that the gravity of the oil becomes progressively lighter from the lower or heavier oil sands to the upper or lighter oil-bearing formations. As a proof of this latter assumption may be cited a well which was drilled and finished to a depth corresponding approximately to one-third of the distance between the two so-called zones, this well having produced a quantity of 48° gravity oil, the uppermost oil sands having been cemented off behind the 8¼″ casing.

Every well drilled in this field to date, except one, has failed to make a definite water shut-off above the first showing of light oil. This fact has led the operators until recently into the belief that the light oil sands carried water. It was only by the accidental freezing of a string of casing, which was being carried with heavy mud-fluid in a well, that water was shut off, temporarily at least. Subsequently an oil sand was encountered a short distance below this shut-off, which produced clean oil of very light gravity. The fact that this upper oil sand produces clean oil definitely disproves the theory advanced by several of the operators that this zone carried water. The stand taken by this department in the past has been that the top oil zone should be considered free from water until proved otherwise.

Recent Developments.

In the proved area of this field five wells are drilling, two wells are idle, and one well is completed. The completed well was drilled by the General Petroleum Corporation on the "Barnard" lease into the upper oil formations. It is producing approximately 60 bbl. of oil of 56° gravity. Several hundred gallons of gasoline per day are extracted from gas, which is treated by an absorption plant.

The idle wells are "Lloyd" No. 1 and "Hartman" No. 1 of the State Consolidated Oil Company. Practically no work has been done at either well during the year, and without a doubt the former well is a serious menace to the upper oil-bearing formations which it has penetrated. This well encountered and logged oil-bearing formations at depths of 2300′ and 2550′, respectively. Water was not shut off above the first oil showing. The 6¼″ water string which was cemented near the bottom of the hole collapsed, and in endeavoring to remove the casing it was found that the 6¼″, 8¼″ and 10″ casings were frozen together. Without conferring with this department in the matter of plugging the lower portion of the well, before leaving the bottom of the hole unprotected the company started shooting, putting in sixteen shots between the bottom of the well and 1900′, at which point the three strings came loose. After removing about 1000′ of 10″, 1200′ of 8¼″, and 1300′ of 6¼″, the remainder of these strings which parted at 1900′ dropped back into the hole. The company then endeavored to sidetrack at 1000′ and froze the new string. Salt water has been flowing continuously from the well since shooting operations were carried on, and the possible damage to the oil measures can only be estimated. Since the future productiveness of the upper oil-bearing horizons in this area depends largely on the ability of the company to exclude water in this well from the oil-bearing formations encountered, it seems necessary and advisable that the company undertake repair work at this well without delay. The redrilling of this well, to properly protect the oil measures, may become a vital necessity in the near future, and should not be delayed until irreparable damage is done.

Of the five drilling wells in this area, the Shell Company of California is operating three, ''Taylor'' No. 1, ''Gosnell'' No. 1, and ''Hartman'' No. 1; the State Consolidated Oil Company is drilling two, ''Lloyd'' No. 2 and ''Lloyd'' No. 3.

The redrilling of ''Lloyd'' No. 2 by the State Consolidated Oil Company was carried on in conformity with the instructions issued by this bureau in Order No. 4 by State Oil and Gas Supervisor R. P. McLaughlin, dated October 31, 1917, which order was the result of a conference of commissioners and operators of this field with representatives from this department, held in Ventura on October 26, 1917. This order (which was printed in full in the Second Annual Report, Bulletin No. 82, p. 193) was issued so that possible further damage to the underground oil supply, due to the condition of the well, might be eliminated by prompt and efficient work.

The results of redrilling this well show that the old hole, through which the well blew out, was apparently followed with very little trouble to a depth of 2126′, where the 10″ was cemented in tight hole, water being partly shut off. Redrilling below this depth may have been into new formation. The 6¼″ casing was frozen at 2218′, shutting off water, and this well, which had originally produced as much as 3000 barrels of sale water per day, is now pumping high gravity oil, free from water.

Well No. 3 ''Lloyd,'' belonging to the same company, has been drilled to a depth of approximately 2800′. Very little oil has been reported as being encountered in the upper oil horizons, and the company has proposed to deepen the well in an attempt to produce from the lower and heavier gravity oil formations. Water has never been excluded from this well, in spite of the fact that it does not flow, and there is a possibility that formations carrying light oil have been penetrated and their oil contents not recognized.

The Shell Company of California, in their well No. 1 "Gosnell," cased off all upper oil-bearing formations carrying light oil, failed to shut off water, and have been endeavoring to produce from formations lower in the oil series, which carry oil of about 30° gravity. The prospects of this portion of the zone can only be estimated at the present time, but from all indications this zone may become very productive. This well is being drilled as a prospect well, and it is the intention of the company, after having prospected the deeper oil measures, or in case other wells in the immediate vicinity obtain production from the shallow oil measures, with water shut off, to then plug the lower portion of the well and shut off water at the proper depth. Oil and water are now flowing from the well under considerable pressure, and the fact that oil would flow at all, with a water column of approximately 3200′, exerting a pressure anywhere from 700 to 1400 lb. per square inch at the bottom of the hole, is sufficient evidence to warrant the assumption that there is a considerable quantity of oil in the pool under pressure great enough to make it flow.

Shell Company well No. 1 "Hartman" (Sec. 22, T. 3 N., R. 23 W., S.B.B. & M.) was completed into the upper oil horizon and the well put on pump. After landing a perforated oil string at this stage, the well made practically no fluid. Upon bailing inside the 8¼″ oil string, it was discovered that only about ten barrels of oil would come in, but the well would flow oil and water between the 10″ water string and the 8¼″. For a time the well was kept bailed down to about 1900′, and from eight to ten barrels of oil and about eighty barrels of water would flow from between the casings. The 8¼″ casing was finally pulled out and found to be collapsed. The well was then cleaned out and pumped inside the 10″ casing, obtaining about 25 bbl. of oil and 300 bbl. of water per day. Subsequently the well sanded up, was cleaned out, the bottom of the hole redrilled, and 6¼″ perforated landed on bottom. Pumping inside the 6¼″ produced only water at the rate of 300 to 400 bbl. per day. By keeping the well pumped down, however, at the above rate of water production, oil would flow between the 6¼″ and 10″ casings at the rate of 20 to 40 bbl. per day and no water.

Upon the completion of the adjoining General Petroleum Corporation well No. 1 "Barnard," production at this well dropped off to about five barrels oil per day. Redrilling was started to shut off water somewhat above the former depth, for the purpose of testing an oil showing which had been previously passed and cemented behind the 10″ casing. The attempt to exclude water proved a failure. The evidence at hand shows the conditions at this well to be rather unique. The source of the oil flowing between the casings was undoubtedly somewhat above the bottom of the hole, since no oil would enter the well through the perforated pipe. It is possible that the water pressure was lowered sufficiently to allow oil to enter the well when the well was pumped. In this case it would seem more natural for the oil to rise than to seek lower levels and enter the perforated pipe. Just how far up the hole the oil was entering is not known, but it seems probable that the source was from an oil sand logged about 40′ above the shoe of the 10″ water string, and that both oil and water were flowing around the shoe of this casing.

Well No. 1 "Tayler," of the Shell Company, located in Rancho San Miguelito, encountered a large volume of gas in formations which correlate with the first oil horizon. The company attempted to produce this gas without success, probably due to the fact that water was not shut off, and that the perforated pipe sanded up. After landing a string of 6¼″ with perforated pipe on the bottom, an attempt to produce the gas was made by bailing and swabbing the well. Very little gas was in evidence. Upon ripping the 6¼″ casing, however, to redrill the well, the original volume of gas was again in evidence, and it was some time before the pressure was overcome sufficiently to allow the mudding of the well. The company then redrilled this well and attempted to shut off water several hundred feet above the gas formations, to test out numerous formations which were originally logged as showing oil, but which had been cased off. Water was shut off temporarily, breaking in again after drilling 4′ ahead of the casing. Having failed to shut off water, the company abandoned the idea of prospecting the upper oil formations and proposed to again pass them up and drill for deeper oil showings.

Summary of Recent Operations.

In reviewing operations in this field during the fiscal year, it should be borne in mind that the drilling conditions encountered are unusual and extremely difficult to overcome. Due to the soft character of the Fernando formation, and the presence of large volumes of salt water and gas, prospecting is very hazardous and oil showings hard to identify. The apparent lack of suitable shale bodies in which to cement or land the water string, tends to complicate the situation. Furthermore, the ability of cement to set and permanently exclude water, in the presence of the gas and salt water, which may be constantly in motion, is seriously questioned. Innumerable attempts to cement wells in this area, and exclude water permanently, have in every case met with failure.

The writer has constantly urged the use of thick mud-laden fluid, with a tapering shoe driven in tight hole in shale, as an experiment to replace the cement method, but until very recently this idea has not found favor. The accidental shutting off of water, due to the freezing of a string of casing which was being carried in a column of thick mud, which case was mentioned previously in this report, has finally turned attention to this matter, and several companies are now proposing to try the experiment, using mud only, instead of mud and cement.

Another factor which seemingly has been a caúse for failure to shut off water, is the tendency of the various companies to carry the water string down to and immediately above the first oil horizon, without first having ascertained that water-bearing formations would be encountered in such close proximity to the oil formations and possibly having penetrated excellent shale bodies at shallower depths in which a water string could be landed with better results. In perhaps one-half of the cases of failure to shut off, the cause may be directly attributed to the fact that the water string was carried down through a portion of the upper oil measures, thus adding three undesirable factors—gas, oil, and water—the latter a flowing water under normal conditions. To these drawbacks must also be added the necessity of keeping the well thoroughly mudded preliminary to cementing, in order to minimize the heavy pressure, and the subsequent impossibility of thoroughly washing the hole ahead of the cement. Under such conditions it is not surprising that so many failures have occurred.

Wildcat Wells.

The following wildcat wells are being drilled outside the limits of proved area in this field:

Shell Company of California "McGonigle" No. 1, Sec. 23, T. 3 N., R. 23 W., S.B.B. & M.

General Petroleum Corporation "Hobson" No. 1, Sec. 22, T. 3 N., R. 24 W., S.B.B. & M.

"McGonigle" well No. 1, of the Shell company, is drilling one and a quarter miles in an air line east of the productive area of this field. It is located on the eastern extension of the Ventura anticline. After reaching a depth of 2900′ the well was bridged and a water string cemented at a depth of about 2800′. Upon cleaning out, the well flowed several million cubic feet of odorless, inflammable gas, and about 300 bbl. of water per day. It has reached a depth of about 3100′ and no oil showings have been reported.

General Petroleum Corporation wells Nos. 1 and 2 "Hobson" are drilling on the extreme western end of the Ventura anticline near the

Pacific Ocean, and are apparently testing this portion of the anticline. As in the producing area, drilling is very difficult on account of salt water and soft sandy formations. Well No. 1 has reached a depth of about 2600′, at which depth the 6¼″ casing was frozen and sidetracking was begun, using a mud circulator. Water has not yet been shut off in this well and no oil bearing formations reported as having been encountered. Well No. 2 has been drilled to a depth of about 1270′, and has been idle for the major part of the year. Water has not been shut off in this well.

Conclusions.

The results of drilling in the southern portion of the Ventura field, during the fiscal year, indicate that further and more extensive developments will be carried on during the coming year. Although the possibilities of the field, from a productive standpoint, have not yet been realized, due to the difficulties in handling the water situation, wells already producing from the light oil horizon have proved to the satisfaction of several operators that this zone is worthy of development alone. In addition, the opening up of deeper oil formations carrying heavier oil as in the Shell Company "Gosnell" well No. 1, the oil being accompanied by a good gas pressure, has given the field a prominent place in prospective productive value.

It is confidently expected that the solution of the water problem will shortly be found, and that soon thereafter the completion of the wells will be assured. With the finishing of the present drilling wells, and the knowledge thereby gained as to the underground structure, will come an extensive drilling campaign, which will probably affect a wide area near the anticline east and west of the Ventura River.

NORTHERN PORTION OF VENTURA FIELD.

During the past year a new company, called the New Mexico Oil Company, has succeeded in proving up new territory which is just east of the Ventura River and several miles west of Sulphur Mountain. The new wells are located in Rancho Ex Mission de San Buena Ventura, and would fall in Sec. 33, T. 4 N., R. 23 W., S.B.B. & M., if subdivided into sections. This company is not the first company which has drilled in this vicinity. Starting in seepages of oil which occur about half a mile northwest of the group of wells now producing on the property of the New Mexico Oil Company, four wells have been drilled in what is known as Jennings Canon. The first well is reported to have been drilled by the Philadelphia California Petroleum Company in the very early days of oil development in California, probably between 1865 and 1870. Neither maps nor records give a clue to the history of this well. The iron casing is still visible at the surface, and heavy oil oozes out.

In the year 1900 two wells were drilled by the San Buena Ventura Oil Company No. 2, being only a short distance from the well drilled by the Philadelphia California Petroleum Company 300′ south of the Dixie National rig now standing. No. 1 was located on the property of J. Hollingsworth, near what would be the southeast corner of Sec. 32, T. 4 N., R. 23 W., S.B.B. & M., if subdivided. No. 1 was drilled to a depth of 1300′, and no oil being found, was abandoned. No. 2, which was started in an oil seepage, was drilled to a depth of 300′, only traces of oil being encountered. It was unproductive, and therefore abandoned.

In 1901 or 1902 the Constitutional Oil Company drilled one well in the group around the Philadelphia California Petroleum Company well in Jennings Canon. It was located 300′ north of the San Buena Ventura well No. 2. After drilling to a depth of 400′, a production of only about four barrels of oil per day was obtained, and the well was therefore abandoned.

The last well to be drilled in this group was drilled by the Dixie National Oil Company in 1908. It was located 11½ feet south of the well drilled by the Constitutional Oil Company. It was drilled to a depth of 720 feet, encountering oil between depths of 300′ and 350′. The production amounted to only three to four barrels of 16° gravity oil per day, and all casing was therefore pulled out, no plugging having been done to protect the oil from a larger quantity of water also encountered. The rig over this well is still standing.

New Mexico Oil Company.

The amount of work done by this company during the past year is shown by the drilling of seven shallow wells near the center of the property. The productive formations from which this company derives its oil have never before been tested, and with the exception of the small producing wells mentioned above, no production has been obtained from this part of the county.

The work of drilling commenced on January 10, 1918. Brown shale was encountered to a depth of 48′, at which depth oil of 29° Baumé entered the well and stood within 15′ of the surface. Another hole was then spudded in, only four feet distant, in which oil was encountered at the same depth. The original hole was then deepened to 220′, and oil reported at depths of 128′ and 175′. Subsequently six other wells were drilled and formations encountered similar to the formations penetrated by well No. 1. All production so far has been obtained from seams in brown shale. Very little water is encountered above a depth of 600′. At this depth, however, considerable water is found in several wells, and it has become necessary to plug the lower portion of a number of the wells.

Geology.

A study of the surface geology near the wells of the New Mexico Oil Company shows that the wells are located a short distance south of the axis of an anticline which is here developed in the Monterey formation. This anticline is very nearly parallel to the fault which marks the contact between the Fernando and the Monterey formations, and which can be plainly seen about one-half mile to the south. The direction of the anticline at this point is N. 50° E., and the dip on the north and south flanks approximately 50° close to the axis. The north flank of the anticline soon develops into a syncline, so that the exact location of the two structures may be easily confused unless care is taken in mapping. The anticline has been followed some distance west and one mile east from the camp of the New Mexico Oil Company. Toward the east it swings to the south, roughly parallel to the major fault mentioned above.

The oil is obtained from shale which has not been eroded at the surface. This probably accounts for the high gravity of the oil. Due to the fractures in the shale, some oil has reached the surface from the shallow oil horizon, and numerous seepages occur at this point and further east close to the axis of the anticline. Further to the south are exposed oil sands, which at one time covered the anticline. Large seepages are found at several localities, the oil originating from these exposed oil sands. There is a possibility, therefore, that commercial production of a heavier oil may be obtained on this property between the region of present development and the fault which marks the southerly limit of the Monterey.

Future Developments.

At the present time two new wells are drilling some distance north and east of the New Mexico Oil Company's property, one by H. L. Hayes and the other by the Riva Oil and Gas Company.

The Hayes well is located practically on the axis of the New Mexico anticline, and about half a mile east of the latter company's well. It would seem that the prospects for obtaining oil in this locality are as favorable as on the New Mexico lease, since structural conditions and the oil formations are very nearly the same.

The wildcat well being drilled by the Riva Oil and Gas Company is located near the south line of Sec. 27, T. 4 N., R. 23 W., S. B. B. & M., and about one mile northeast of the Hayes well. An examination of the geology of this vicinity shows that the well is located on the north flank of the syncline which parallels the New Mexico anticline on the north. It is, therefore, about half a mile north of the New Mexico anticline, and any production obtained at this point will no doubt open up much larger areas in this field for development.

Production and Water Conditions for the Entire Field.

The production of this field for the fiscal year amounted to 17,848 bbl. of oil and 104,228 bbl. of water, or a daily production of 161.8 bbl. of oil and 527.6 bbl. of water for the field. The production per producing well per day was 18 bbl. of oil and 58.6 bbl. of water, or 76.7 per cent water.

Of the 17,848 bbl. of oil produced by the field during the year, approximately one-half was produced from the New Mexico anticline in a period of three months. The water produced in this portion of the field amounted to only 1 per cent, so that the correct percentage of water for the Ventura field proper is 91 per cent. This will serve as an idea of the water situation on the properties of the Shell Company of California, the State Consolidated Oil Company, and the General Petroleum Corporation, which companies are the only operators in the Ventura field proper. As previously mentioned in this report, it is hoped that, during the coming year, the water troubles will be overcome by new methods and the amount of oil production greatly increased.

TABLE X.

Ventura Field.

Section, township, range	Company	New wells		Test of shut-off		Deepen, redrill, etc.		Abandon		Supplementary	
		Notices	Decisions	Notices	Decisions	Notices	Decisions	Notices	Decisions	Notices	Decisions
16-3 N.-23 W.	Dabney & Lloyd							1	1		
21-3 N.-23 W.	Shell Company of California			4	2	5	5			8	7
22-3 N.-23 W.	Shell Company of California					2	2				
23-3 N.-23 W.	Shell Company of California			1						1	1
22-3 N.-23 W.	State Consolidated Oil Company	1	1		2					5	4
22-3 N.-23 W.	General Petroleum Corporation				1						
22-3 N.-24 W.	General Petroleum Corporation			1						1	1
33-4 N.-23 W.	New Mexico	7	7							1	
33-4 N.-23 W.	H. L. Hayes	1	1								
	Totals	9	9	6	5	7	7	1	1	16	13

MISCELLANEOUS FIELDS.

Drilling operations in progress during the fiscal year, outside of the producing fields in the county, were carried on by the companies as shown in Table XI.

The two wells drilled by the St. Helens Petroleum Company on the Lanning and Lewis Ranchos, respectively, T. 2 N., R. 21 W., S. B. B.

& M., located a short distance south of the town of Camarillo, were carried to shallow depths only. The penetration of formations described as "Metamorphic" led to a discontinuance of drilling and the conversion of the wells into water wells. No oil is reported as having been encountered.

The well being drilled by Joseph B. Dabney is located on the axis of a plunging anticline approximately one and a half miles north of the town of Camarillo. Drilling starts in beds of upper Fernando or San Pedro formations. The dip on either flank of the anticline is approximately 30° and the axis at this point is noticeably plunging toward the west. At the present writing the drill has apparently passed out of the Fernando formation and entered beds of probable Puente age. A slight showing of oil was noticed near the contact of the two formations. As the beds which underlie the Puente formation are exposed further up the anticline and in South Mountain to the north, it is probable that a continuance of drilling will expose the Vaqueros formation, which is here interbedded with conglomerate and some basalt, and possibly the upper portion of the Sespe formation. There is undoubtedly a marked unconformity between the Fernando and Puente beds, since the Puente is entirely missing where the Vaqueros is exposed on the rising end of the dome about three miles east of the well.

The True Oil Company is still engaged in the deepening of its well in the Cuyama Valley in Sec. 2, T. 9 N., R. 24 W., S. B. B. & M., near the northwest corner of the county and about 22 miles south of Maricopa. Bulletin No. 621-M issued by the United States Geological Survey on "The Geology and Oil Prospects of Cuyama Valley, California," describes the conditions at this well, which was originally started and drilled to a depth of 1800 feet by the Webfoot Oil Company, as follows:

> "The Webfoot well, in a narrow gulch on the north side of Ballinger Cañon, in the S. W. quarter, section 2, Township 9 N., Range 24 W., was started about 1905, and drilling continued intermittently for a number of years. It is said to have reached a depth of 1800 feet without encountering any oil. The well starts in nearly vertical beds of brown sandy shale of the Monterey group."

The conditions, as reported in this article, have been verified by the writer and found to be practically as stated. Drilling during the past year has not disclosed oil in commercial quantities.

Table XI, which follows, shows the notices received and reports issued for miscellaneous fields in the district during the fiscal year.

TABLE XI.

Miscellaneous.

Section, township, range	Company	New wells		Test of shut-off		Deepen, redrill, etc.		Abandon		Supplementary	
		Notices	Decisions	Notices	Decisions	Notices	Decisions	Notices	Decisions	Notices	Decisions
--2 N.-21 W.	St. Helens Petroleum	2	2	----	----	----	----	----	----	----	----
--2 N.-21 W	Joseph B. Dabney	1	1	1	----	----	----	----	----	----	----
2-9 N.-24 W.	True Oil	----	----	----	----	1	----	----	----	----	----
	Totals	3	3	1	----	1	----	----	----	----	----

DECISIONS.

PIRU FIELD.

T. 3 N., R. 18 W., S.B.B. & M.

SECTION 1.

Beatty Oil and Development Co.

Well No. 2, abandon. P 2-121.

Approved proposal of the company to abandon this well as outlined in the notice of abandonment, specifying depths at which cement plugs should be placed and from which casing was to be pulled. In attempting to pull the 8¼″ casing, this casing was ripped in several places. More oil was discovered coming from behind the pipe and the well was put on the beam again with considerable increase in production.

T. 4 N., R. 18 W., S.B.B. & M.

SECTION 8.

Diamond Valley Oil Co.

Well No. 4, supplementary to drill. P 2-28.

Approved proposal of the company relative to change of shut-off depth previously proposed due to encountering oil at a shallower depth than anticipated.

Well No. 4, shut-off. T 2-18.

Test of water shut-off approved.

SECTION 32.

Midway Supply Co.

Well No. 1A, Cameron, abandon. P 2-45.

Recommended the company abandon this well as proposed.

Well No. 1A, Cameron, supplementary to abandon. P 2-73.

After receipt of history of abandonment, the work as completed having conformed to original proposal, final approval was given.

Well No. 1, Cameron, abandon. P 2-44.

Recommended plugging in shale formation with cement between specified depths, final approval to be given upon receipt of completion report.

Well No. 1, Cameron, supplementary to abandon. P 2-74.

Upon receipt of final report of abandonment, the work having been carried out as recommended, final approval was given.

Well No. 2, Cameron, abandon. P 2-43.

Recommended plugging with cement in shale bodies between certain specified depths. Recommendation differed from the proposal in location of plugs to be placed in the well. Final approval contingent upon receipt of completion report showing work done as recommended.

Well No. 2, Cameron, abandon—supplementary. P 2-75.

Final approval of abandonment given as work was done according to recommendation.

SECTION 33.

C. Victor Stephens.

Well No. 1, Winnipeg, abandon. P 2-25.

Approved method of abandonment as outlined in the proposal, determination to be made that cement plugs set properly before proceeding with subsequent work.

Well No. 2, Winnipeg, abandon. P 2-26.

Approved method of abandonment as outlined in the proposal in same manner as Well No. 1.

Well No. 3, Winnipeg, abandon. P 2-27.

Approved method of abandonment as outlined for Well No. 1.

SECTION 34.

C. Victor Stephens.

Well No. 1, Eureka Cañon Syndicate, abandon. P 2-18.

Approved the company's method of abandonment.

Well No. 2, Eureka Cañon Syndicate, abandon. P 2-85.

Recommended plugging with cement in shale formation between certain specified depths. Recommendation differed somewhat from the proposal in respect to the location of plugs. Required final report of work done before approval could be given.

Well No. 3, Eureka Cañon Syndicate, abandon. P 2-19.

Approved the company's method of abandonment as outlined in the proposal.

SECTION 36.

Beatty Oil and Development Co.

Well No. 3, redrill. P 2-8.

The company submitted a proposal which was approved by this report looking toward the elimination of water which had broken in from the top, by cutting out the 8¼″ casing and tamping outside the 6¼″ with the 10″ casing, from a depth of 400′. The work was successfully carried out as proposed according to later report from the company.

Well No. 4, drill. P 2-106.

The proposal to drill was rejected owing to the lack of definite location of the well on notice to drill.

Well No. 4, drill. P 2-107.

Information which was lacking in notice to drill was filed and approval of the company's proposal was given to shut off water at a depth of about 450′.

Well No. 4, test of shut-off. T 2-64.

Test of water shut-off approved as satisfactory.

SIMI FIELD.

T. 3 N., R. 18 W., S.B.B. & M.

SECTION 32.

Doheny-Pacific Petroleum Co.

Well No. 2, Scarab, drill. P 2-2.

The company stated that this was a wildcat well and no estimate was given for depth of shut-off or oil sands. Recommended that each string landed below a depth of 100′ be cemented.

Well No. 2, Scarab, shut off. T 2-15.

Test of water shut-off satisfactory for 12½″ cemented at 1205′.

Well No. 2, Scarab, shut off. T 2-27.

Water not shut off with 10″ casing. Recommended further tests, recementing, or use of another water string.

Doheny-Pacific Petroleum Co.—Continued.

Well No. 2, Scarab, supplementary. P 2-78.

Approved proposal to cement 8¼" at a lower depth to shut off water.

SECTION 35.

Doheny-Pacific Petroleum Co.

Well No. 6, deepen. P 2-122.

Approved proposal to deepen the well.

Well No. 16, drill. P 2-33.

Approved proposal of the company to shut off water at a depth of about 600'.

Well No. 16, supplementary. P 2-47.

Approved proposal to shut off at a lower depth.

Well No. 16, shut off. T 2-20.

Test of water shut off with 8¼" approved.

Well No. 16, alter casing. P 2-58.

Approved proposal to pull 12½" and 10" casings.

Well No. 17, drill. P 2-34.

Recommended water shut-off at a depth of about 600' as proposed.

Well No. 17, supplementary. P 2-55.

12½" was cemented at 534' and water encountered at 537'. Approved proposal to cement 10" casing through water formation at a depth of about 700'.

Well No. 17, alter casing. P 2-56.

Approved proposal to remove 12½" and 10" casings.

Well No. 17, shut off. T 2-25.

Test not conclusive. Water entering the well.

Well No. 17, supplementary. P 2-64.

Approved proposal to set anchor packer to determine source of water.

Well No. 17, supplementary. P 2-67.

Recommended plugging bottom of the hole before cutting 8¼" casing to carry same for lower shut-off.

Well No. 17, supplementary. P 2-70.

As 8¼" was removed without cutting, approved proposal to ream old hole and cement at 1045'.

Well No. 17, shut off. T 2-40.

Final approval of test of water shut-off.

Well No. 18, drill. P 2-39.

Approved company's proposal to shut off water at a depth of about 500'.

Well No. 18, shut off. T 2-26.

Test of water shut off approved as satisfactory.

Well No. 19, drill. P 2-82.

Approved casing landing at a depth of 613'. No water encountered above this depth.

Well No. 19, shut off. T 2-37.

Results of test showed no water entering the well.

Well No. 20, drill. P 2-81.

Recommended that water be shut off at a depth of about 550' instead of 800' as proposed.

Well No. 20, supplementary. P 2-90.

Approved supplementary proposal to shut off water at a depth of about 500'.

Well No. 20, shut off. T 2-43.

Test of water shut-off at 510' satisfactory.

Well No. 20, abandon. P 2-137.

Recommended abandonment and plugging with two alternatives depending upon amount of casing which could be removed.

Well No. 20, supplementary. P 2-146.

Approved proposal to suspend work of abandonment and allow the well to produce gas.

Doheny-Pacific Petroleum Co.—Continued.

Well No. 21, drill. P 2-135.

Notice to drill stated the department would receive further information as drilling progressed but no further information was received until casing was landed and notice of test of water shut-off filed. Approval was given to continue drilling.

Well No. 21, shut off. T 2-60.

Test of shut-off approved.

Well No. 22, drill. P 2-134.

No estimate was given as to depth of water shut-off. Recommended shutting off water by mudding or cementing at a depth of about 800′.

Well No. 22, shut off. T 2-71.

Small amount of salt water entering the well. Approved proposal to deepen 100′ and test again.

SECTION 36.

Doheny-Pacific Petroleum Co.

Well No. 10, supplementary to drill. P 2-126.

Because this well was already drilled through the first oil horizon before the notice was received and on account of mechanical difficulties involved in backing up to test the horizon, approval was given to mud the formations and land casing at a depth of about 750′, the possibilities of the horizon to be prospected with a new well in this area.

Well No. 10, shut off. T 2-55.

Test of water shut-off approved.

Well No. 23, drill. P 2-147.

Recommended that water be shut off at a depth of about 500′ instead of 700′ as proposed.

Santa Susana Oil Corporation.

Well No. 1, deepen. P 2-149.

The proposal of the company to deepen as outlined was satisfactory.

Well No. 7, new well. P 2-111.

Approved company's proposal as to depth of water shut-off.

Well No. 7, supplementary to drill. P 2-123.

Approved supplementary proposal relative to change in shut-off depth.

Well No. 7, shut off. T 2-61.

Water shut off with 10″ casing. Test approved.

Well No. 8, new well. P 2-138.

Approved company's proposal as to depth of water shut-off.

Well No. 8, shut off. T 2-65.

Water not shut off. Approved proposal to loosen water string and carry to lower depth for shut-off.

Well No. 8, shut off. T 2-67.

Water shut off with 12½″ casing. Test approved.

BARDSDALE FIELD.

T. 3 N., R. 19 W., S.B.B. & M.

SECTION 3.

Home Ranch Petroleum Co.

Well No. 1, deepen. P 2-77.

Approved company's proposal to deepen this well about 100′.

Well No. 1, shut off. T 2-58.

This well produces oil, free water and emulsion. Reports from the company indicated that the emulsion carried no water in suspension. A production test was witnessed at the well and the total amount of water produced was reported. This report differed from the company's estimate mainly because the emulsion upon distillation test showed 62% water. Source of the water was not determined.

Calumet Oil Co.

Well No. 8, commence drilling. P 2-61.

Recommended that water be shut off fifty feet higher than proposed, in order that the depth of shut-off might be uniform stratigraphically with shut-off depth in neighboring wells.

Well No. 8, shut off. T 2-41.

Water was shut off at a lesser depth than proposed or recommended. Test of shut-off approved.

Well No. 9, shut off. T 2-33.

The report states that the company shut off water in this well 200′ feet lower than proposed. The department was not notified of change in proposal. Data on file indicates that water was carried down into the top of the second oil zone. Approval was given to proceed with drilling, condition of well being satisfactory, providing no damage should ensue as a result of lower shut-off.

SECTION 4.

Montebello Oil Co.

Well No. 66, deepen. P 2-11.

Approved the company's proposal to deepen the well.

Well No. 66, shut off. T 2-29.

Production test, witnessed after well was deepened and bottom water plugged off. Test indicated that not all water was shut off. Recommended further pumping to determine whether or not the amount of water would increase, and advised further plugging if the water did not decrease.

Well No. 81, plug well. P 2-5.

Approved company's proposal of plugging the well.

Well No. 81, supplementary-deepen. P 2-51.

Approved company's proposal to shut off water with 6¼″ casing above third oil zone to test out same.

Well No. 81, shut off. T 2-44.

The company stated that 6¼″ casing was cemented above third oil zone and water not shut off. The third oil zone was then penetrated and tested with water not shut off. The hole was then plugged up to within 2′ of the 6¼″ casing when the above-mentioned test was witnessed. Test indicated that oil was plugged off and water was entering the well around the shoe of the 6¼″ casing.

Well No. 81, redrill. P 2-99.

Recommended mudding the bottom of the well under pressure before abandoning the lower portion of the hole.

Well No. 81, supplementary—redrill. P 2-103.

Upon receipt of additional information contained in supplementary notice, recommended the well be not mudded as provided in P 2-99 and specified placing certain cement plugs.

Well No. 82, shut off. T 2-2.

Production test indicated that water was shut off. Test approved.

Well No. 87, shut off. T 2-1.

Test showed water had risen 119′ while standing for test. Recommendations were made concerning plugging the bottom of the well and conducting further tests.

Well No. 87, shut off. T 2-4.

Result of test showed that water was entering the well at the rate of 1′ per hour, source not determined. Approved proposal to deepen and shut off water lower down.

Well No. 87, shut off. T 2-9.

Water was shut off with 10″ casing. Test approved.

Well No. 87, shut off. T 2-36.

Bottom water was encountered and successfully excluded from the well by plugging the bottom of the well and cementing the 8¼″ casing. Test approved.

Montebello Oil Co.—Continued.

Well No. 101, shut off. T 2-10.

Test of water shut-off approved.

Well No. 101, shut off. T 2-16.

Water not shut off. Recommended additional tests.

Well No. 101, shut off. T 2-32.

Pumping test showed oil and water to be entering the well. Upon deepening the well and before landing and cementing a water string above the second oil zone, recommended mudding the well under pressure to protect the oil formations open in the well at the time of test.

Well No. 102, plug bottom. P 2-14.

Approved a proposal from the company to plug the lower portion of the well to locate the source of the water. Recommended plugging at certain depths in case the source was not determined by the first plug.

Well No. 102, supplementary—redrill. P 2-57.

Approved proposal to do further plugging under changed conditions.

Well No. 102, supplementary—recement. P 2-66.

Proposal to recement approved.

Well No. 102, supplementary—recement. P 2-76.

Proposal approved.

Well No. 102, supplementary—redrill. P 2-72.

Proposal to redrill, carrying the 8¼″ casing to a lower depth to shut off water was satisfactory.

Well No. 102, supplementary—recement. P 2-127.

Water not shut off. Proposal to recement approved.

Well No. 102, supplementary—redrill. P 2-150.

Approved proposal to loosen the 8¼″ and carry to lower depth for shut off, specifying mudding of portion of top of second oil zone cased off.

Well No. 103, commence drilling. P 2-24.

Approved company's proposal to shut off water at a depth of 1250′.

Well No. 103, supplementary to drill. P 2-46.

Upon complaint of a neighboring operator the question of depth of water shut-off was again considered and as a result of conference between these two companies and a representative of this department, a recommendation was made to shut off water at a shallower depth in order to protect formations which were open in adjoining wells and continue the policy of uniform stratigraphic shut-off.

This report supplements Report No. P 2-24, shown above.

Well No. 103, shut off. T 2-38.

The well was bridged back 100′ to cement the water string as requested in Report No. P 2-46. Water was shut off and test approved.

Well No. 103, shut off. T 2-51.

An additional shut-off was made in this well at a lower depth, although no further water formations were encountered. Test showed no fluid entering the well.

Well No. 109, shut off. T 2-45.

Pumping test. Results not conclusive. This test was witnessed for plugging off bottom water after perforating the oil string.

Well No. 109, redrill. P 2-101.

Approved proposal of the company to abandon the lower portion of the well.

Well No. 109, supplementary—redrill. P 2-120.

Approved proposal to pull out 8¼″ and make production test.

Well No. 109, shut off. T 2-57.

Result of pumping test demonstrated that water was successfully excluded from the well by plugging in the bottom.

Well No. 113, shut off. T 2-19.

Water shut off above the recently discovered third oil zone was approved as satisfactory.

SECTION 5.

Petroleum Midway Co., Ltd.

Well No. 1, Waddle-Jenkins, new well. P 2-59.

Proposal contained no estimate for depth of water shut off. Recommended that water be shut off above oil-bearing formations if found by bridging back and cementing a string of casing.

Montebello Oil Co.

Well No. 1, Elkins, abandon. P 2-92.

Approved method of abandonment proposed by the company, specifying testing by a representative from this department, of cement plugs placed in the well.

Well No. 1, Elkins, supplementary—abandon. P 2-130.

Final approval of abandonment given, the work having been carried out as proposed.

SECTION 6.

Montebello Oil Co.

Well No. 1, Burson, abandon. P 2-148.

Approved proposed method of abandonment, specifying shooting and plugging between certain depths and testing of all plugs.

Well No. 2, Burson, abandon. P 2-128.

Recommended plugging between certain depths not included in the proposal. Recommendations were based upon data obtained by the construction of a peg model of this field by this office, which information was not available at the time of filing this notice.

T. 3 N., R. 20 W., S.B.B. & M.

SECTION 12.

Union Oil Co. of California.

Well No. 15, shut off. T 2-34.

No water was reported to have been encountered in drilling this well. A bailing test was witnessed upon perforating an oil string and testing for productiveness. Test showed a small amount of oil and water entering the well and indicated that the water was return drilling water. For more definite information a production test was called for 60 days after completion.

Wm. Z. McDonald.

Well No. 1, West Huasna, abandon. P 2-21.

Recommended certain tests to determine the condition of the well and required additional information before approving its abandonment.

Well No. 1, West Huasna, shut off. T 2-13.

This test was witnessed as requested in our report No. P 2-21 to determine the condition of the well. A small amount of water and very little oil entered the well while standing for test. Test was made by bailing down inside of a perforated oil string.

Well No. 1, West Huasna, abandon. P 2-29.

The information requested in Report P 2-21 having been filed, the proposal to abandon the well was approved and the method to be followed in abandonment was outlined. Final report of work done was requested.

Well No. 1, West Huasna, supplementary—abandon. P 2-48.

Due to changed conditions, the 8¼" casing having parted, a new proposal was entered and approved. Final report requested.

Well No. 1, West Huasna, supplementary—abandon. P 2-65.

Upon receipt of final report of work done, the work having been carried out as proposed, final approval of abandonment was given.

Well No. 2, West Huasna, abandon. P 2-22.

Outlined method of abandonment specifying plugging with cement in certain shale bodies.

Well No. 3, West Huasna, abandon. P 2-23.

Method of abandonment outlined and certain cement plugs required to be placed in the well.

SESPE FIELD.

T. 4 N., R. 19 W., S.B.B. & M.

SECTION 6.

Sudden and Emslie.

Well No. 4, redrill. P 2-42.

Proposal was rejected, logs of wells on this property not having been filed.

Well No. 4, redrill. P 2-50.

All information available having been filed regarding the logs of wells on the property, the proposal as outlined was approved. The log of this well gave only its casing record. Requested that the company keep a record of all work done on the well and file a history of operations when completed.

Well No. 4, abandon. P 2-100.

Recommended certain tests to locate source of water entering the well before abandonment in order that it might be properly plugged.

Well No. 4, supplementary—abandon. P 2-142.

Approved method proposed to abandon the well under changed conditions. Rig timbers and derrick only to be moved.

Well No. 4, shut off. T 2-66.

Test witnessed to determine the results of plugging the bottom of the well in abandonment, to prevent the downward passage of water into oil-bearing formations. Test satisfactory.

SECTION 20.

Oak Ridge Oil Co.

Well No. 1, Faulkner, abandon. P 2-91.

Outlined method of abandonment and requested final report when work was completed.

Well No. 1, Faulkner, supplementary—abandon. P 2-97.

Approved slight change in method of abandonment due to changed conditions arising during operations.

Well No. 1, Faulkner, supplementary—abandon. P 2-131.

Final approval of abandonment given, final report having been received and work having been carried out as recommended.

T. 4 N., R. 20 W., S.B.B. & M.

SECTION 1.

Kentuck Oil Lease.

Well No. 7, Kentuck, shut off. T 2-56.

This well was finished and producing without a test for water shut-off having been witnessed by this department. Consequently a production test was called for and final approval of water shut-off given upon the results of this test.

T. 5 N., R. 19 W., S.B.B. & M.

SECTION 33.

White Star Oil Co.

Well No. 16, shut off. T 2-6.

Test of water shut-off approved as satisfactory.

T. 5 N., R. 20 W., S.B.B. & M.

SECTION 23.

Big Sespe Oil Lease.

Well No. 8, commence drilling. P 2-30.

The method of drilling this well as outlined was satisfactory.

Well No. 8, shut off. T 2-39.

Results of test showed water to be shut off with 15½" casing.

Well No 8, shut off. T 2-50.

Results of test showed additional water encountered to have been shut off with 12½" casing.

SOUTH MOUNTAIN FIELD.

T. 3 N., R. 20 W., S.B.B. & M.

SECTION 17.

United Oil Company.

Well No. 2, shut off. T 2-3.

Water not shut off. Recommended further bailing tests.

Well No. 2, shut off. T 2-5.

After continued bailing, water was practically exhausted and approval given to continue drilling.

Well No. 2, shut off. T 2-22.

This test was witnessed in conjunction with the following test to determine whether water entering the well was coming from the bottom of the well or around the 6¼″ casing. The bottom of the hole being plugged for this test, the water rose only about 25′.

Well No. 2, shut off. T 2-23.

The result of this test together with test reported above (T 2-22) showed that after drilling out the plug in the bottom of the well, water rose to its original level (526′ from surface) demonstrating that the source of the water was below the 6¼″ casing.

Well No. 2, alter casing. P 2-62.

Approved proposal to locsen the 6¼″ casing and carry same below source of water.

Well No. 2, supplementary—deepen. P 2-79.

Proposal of the company to plug in casing left in the bottom of the well and sidetrack same, prospecting for oil measures, was approved.

SECTION 18.

Santa Paula Oil Co.

Well No. 1, deepen. P 2-32.

Approved proposed method of deepening.

Well No. 1, deepen. P 2-105.

Approved further deepening of the well.

Well No. 2, Santa Paula, deepen. P 2-36.

Recommended that the company deepen the well as proposed.

Well No. 2, Santa Paula, deepen. P 2-110.

Approved method of further deepening.

Well No. 4, Santa Paula, commence drilling. P 2-71.

Approved depth of shut-off as proposed.

Well No. 4, Santa Paula, shut off. T 2-52.

Water shut off. Test approved.

Well No. 6, Santa Paula, new well. P 2-145.

Recommended that water be shut off 125′ lower than proposed.

Oak Ridge Oil Co.

Well No. 1, Willard, shut off. T 2-17.

Results of production test indicated that no water was entering the well. Test approved.

Well No. 1, Willard, deepen. P 2-54.

Approved method of deepening.

Well No. 1, Willard, shut off. T 2-54.

Bailer brought up emulsion. Deferred test until completion when production test will be taken.

Well No. 2, Willard, deepen. P 2-84.

Proposed method of deepening approved.

Well No. 2, Willard, supplementary—test. P 2-156.

Approved proposal to defer test on landing of casing until completion by taking production test after gas pressure has subsided.

Well No. 3, Willard, supplementary—recement. P 2-7.

Proposal to loosen water string and cement at lower depth on account of additional water encountered, was approved.

Oak Ridge Oil Co.—Continued.

Well No. 3, Willard, shut off. T 2-8.

Test of water shut-off satisfactory.

Well No. 3, Willard, deepen. P 2-104.

Approved method of deepening.

Well No. 4, Willard, shut off. T 2-69.

Water shut off. Test satisfactory.

Well No. 5, Willard, new well. P 2-12.

Approved proposed depth of water shut-off.

Well No. 5, Willard, redrill. P 2-109.

Proposal to loosen 12½" water string to cement at a lower depth to shut off additional water encountered, was approved.

Well No. 5, Willard, shut off. T 2-53.

Test of water shut-off approved.

Well No. 7, Willard, new well. P 2-37.

Approved proposed depth of water shut-off.

Well No. 7, Willard, shut off. T 2-24.

Test of water shut-off satisfactory.

SECTION 29.

Hondo Oil Co.

Well No. 1, commence drilling. P 2-15.

Wildcat well. Recommended that each string landed be cemented. Information requested during progress of work.

Well No. 1, shut off. T 2-28.

Test of water shut-off satisfactory.

Well No. 1, abandon. P 2-136.

Recommended method of abandonment, specifying certain plugging in bottom of hole and on top of 10" casing left in the hole. Required completion report, showing work done in abandonment.

T. 3 N., R. 21 W., S.B.B. & M.

SECTION 13.

Oak Ridge Oil Co.

Well No. 1, Yale Richardson, shut off. T 2-12.

Water shut off with 10" casing. Test approved.

Well No. 1, Yale Richardson, shut off. T 2-48.

Test witnessed of landing of casing as a precaution against encountering bottom water. Test showed no fluid to be entering the well.

Well No. 1, Yale Richardson, shut off. T 2-68.

Well tested for results of plugging bottom of well. Test not conclusive. Production test to be taken 60 days after completion of the well.

Well No. 1, Harvey, shut off. T 2-7.

Water shut off with 12½" casing. Test satisfactory.

Well No. 1, Harvey, deepen. P 2-98.

Approved proposed method of deepening the well.

Well No. 3, Harvey, commence drilling. P 2-129.

Report delayed until completion of peg model of this field. Casing was landed for water shut-off before report was written. Depth of shut-off was approved on report of shut-off shown below.

Well No. 3, Harvey, shut off. T 2-63.

Results of test indicate water shut off. Test satisfactory.

Well No. 1, Louis Richardson, deepen. P 2-124.

Proposed method of deepening was satisfactory.

H. P. Oates.

Well No. 1, commence drilling. P 2-4.

Approved proposed depth of water shut-off.

Union Oil Co. of California.

Well No. 1, Oates or Crane, supplementary to drill. P 2-49.

Supplements and amends Report P 2-4. Recommended water shut-off above oil-bearing formations encountered in drilling.

Well No. 1, Crane, shut off. T 2-62.

All water not excluded at time of test. Recommended continuance of drilling and cementing of water string lower down. Since engineering data on file in this office indicated additional water-bearing formations would be encountered. Additional water was encountered as predicted.

SECTION 14.

Oak Ridge Oil Co.

Well No. 1, George Richardson, new well. P 2-140.

Development in this area not sufficient to determine in advance depth at which water should be shut off. Recommended that water should be shut off above oil-bearing formations, if encountered, by bridging back and cementing a string of casing.

Well No. 1, Frank Richardson, new well. P 2-139.

Not sufficient data at hand to indicate depth at which water should be shut off as this is a wildcat well. Recommended that water be shut off above oil-bearing formations, if encountered, by bridging back and cementing a water string.

SANTA PAULA FIELD.

T. 4 N., R. 20 W., S.B.B. & M.

SECTION 18.

Timber Cañon Syndicate.

Well No. 1, shut off. T 2-49.

The department was not notified to witness test of water shut-off until after the well had been completed and had been producing some time. While the well was being prepared to deepen, a bailing test was secured, the results of which indicate that no water is entering the well.

Well No. 1, deepen. P 2-114.

Method of deepening the well as outlined was approved.

SECTION 20.

Santa Clara Oil and Development Co.

Well No. 1, shut off. T 2-46.

Results of test show water to be shut off. Test satisfactory.

SECTION 29.

Mausard and Jameson.

Well No. 1, commence drilling. P 2-35.

The company made no estimate as to depth of water shut-off, since this is a wildcat well. Proposal to keep this office informed during drilling and take up the matter of water shut-off at a later date was approved.

T. 4 N., R. 21 W., S.B.B. & M.

SECTION 22.

American Ventura Oil Co.

Well No. 10, shut off. T 2-31.

Result of test showed water to be shut off and test was approved as satisfactory.

T. 4 N., R. 22 W., S.B.B. & M.

SECTION 25.

Saltmarsh Cañon Oil Co.

Well No. 20, commence drilling. P 2-113.

The method of drilling this well as outlined was satisfactory.

OJAI FIELD.

T. 4 N., R. 21 W., S.B.B. & M.

SECTION 7.

Hill Top Oil Co.

Well No. 1, abandon. P 2-3.

Outlined method of abandonment, specifying cement plugs between certain depths. Required that completion report be filed.

Interstate Oil Co.

Well No. 1, Hill Top, test plug. T 2-21.

After testing cement plug, which had been placed during the work of abandonment, plug was found to be soft. Supplementary notice to discontinue abandonment and attempt to drill the well to further oil sands, was filed, and this test was therefore approved as satisfactory in order that the work of deepening could proceed.

Well No. 1, Hill Top, supplementary, redrill. P 2-63.

Instead of abandoning the well which work had already been started, the company proposed to redrill the well and attempt to obtain production. The proposal was approved as outlined.

Well No. 1, Hill Top, redrill. P 2-94.

Proposal to redrill under changed conditions was approved.

Well No. 1, Hill Top, supplementary, redrill. P 2-119.

Approved supplementary proposal to shut off water above first oil sand encountered and test out upper zone, after plugging bottom of well.

SECTION 8.

Great Republic Oil & Paint Co.

Well No. 2, shut off. T 2-47.

The department was not called upon to witness test of water shut-off at the time of landing casing for this purpose. Accordingly a test was called for, the water bailed out to bottom and a column of oil left in the hole to prevent freezing of the casing. Only a small amount of water had entered the well while standing for test, but due to the presence of the column of oil with sufficient pressure to temporarily prevent entrance of possible water, a production test was requested upon completion of the well.

SECTION 17.

Capitol Crude Oil Co.

Well No. 24, shut off. T 2-14.

This well was completed without approval of test of water shut-off from the department. To clear the records a production test from lead line was taken and test reported satisfactory.

T. 4 N., R. 22 W., S.B.B. & M.

SECTION 11.

Pan-American Petroleum Co.

Well No. 6, Vogel, commence drilling. P 2-1.

Records on file were not sufficient to determine in advance depth of water shut-off. Recommended that formations producing oil in adjoining wells be protected from water.

Well No. 6, Vogel, supplementary to drill. P 2-125.

Approved supplementary proposal to drill up and sidetrack 12½" casing collapsed near shoe and prospect ahead with the 10" casing.

SECTION 12.

Santa Maria Crude Oil Co.

Well No. 3, shut off. T 2-11.

Water shut off. Test satisfactory.

SECTION 14.

Pan-American Petroleum Co.

Well No. 36, deepen. P 2-10.

Approved method proposed for deepening.

Well No. 37, commence drilling. P 2-9.

Approved proposed depth of water shut-off.

Well No. 37, abandon. P 2-88.

Approved proposal to pull out all casing possible, and fill hole with mud, no plugging being necessary, on account of oil-bearing formations not having been penetrated.

SECTION 15.

Pan-American Petroleum, Co.

Well No. 1, Pinkerton, new well. P 2-52.

Wildcat well. Information not sufficient to indicate exact depth at which water should be shut off. Recommended cementing each string of casing landed above oil-bearing formations in order that such formations could be properly tested.

VENTURA FIELD.

T. 3 N., R. 23 W., S.B.B. & M.

SECTION 16.

Dabney and Lloyd.

Well No. 1, Traders, abandon. P 2-16.

In order to protect gas-bearing formations encountered in drilling, oil formations penetrated not having proven commercially productive, recommendation was made that mud laden fluid be pumped into the well under pressure and forced back into the gas sands and that the mud be left in contact with the sand in the bottom of the well. The proposal to thereafter remove all casing possible from the well was approved.

SECTION 21.

Shell Company of California.

Well No. 1, Taylor, redrill. P 2-6.

The proposal to redrill the well in an attempt to produce the gas encountered in the bottom of the well was approved as satisfactory.

Well No. 1, Taylor, deepen. P 2-89.

The company entered a proposal to deepen the well through what was ostensibly the upper oil horizon with water not shut off. The proposal to deepen was approved with provision that in case oil-bearing formations were encountered during drilling operations, it would be necessary for the company to bridge above such showing and cement a water string for shut-off in order that such formations could be tested for productiveness.

Well No. 1, Taylor, supplementary to deepen. P 2-102.

The company then entered supplementary proposal to redrill the well at former shut-off point and endeavor to shut off water at approximately the same depth as formerly and attempt to produce the gas previously encountered. This proposal was approved.

Well No. 1, Taylor, shut off. T 2-70.

Test showed no water entering the well. Approval given to proceed with drilling.

Well No. 1, Gosnell, deepen. P 2-20.

A proposal to change the shut-off depth and deepen the well on account of absence of oil indications was approved.

Well No. 1, Gosnell, supplementary to deepen. P 2-31.

Having encountered a good showing of oil, the proposal to cement a water string above this showing was also approved.

Well No. 1, Gosnell, supplementary, recement. P 2-41.

Water not shut off with first cement job. Circulation established. Approved proposal to recement.

Shell Co. of California—Continued.

Well No. 1, Gosnell, shut off. T 2-30.

A production test taken after cementing the 8¼″ casing showed no water.

Well No. 1, Gosnell, redrill. P 2-69.

A proposal to pull the liner from the bottom of the well and bail to let sand in was approved.

Well No. 1, Gosnell, deepen. P 2-86.

Proposal to deepen was approved with provision that if the amount of water shown by previous production did not diminish upon subsequent tests, it might become necessary to repair the well.

Well No. 1, Gosnell, supplementary to deepen. P 2-87.

Approved method outlined of testing out oil sand encountered.

Well No. 1, Gosnell, supplementary to deepen. P 2-95.

Following a conference of oil operators in this field, approval was given to carry the water string down through the oil sands encountered and previously tested, water not being shut off, and to mud and cement this casing above deeper oil sands, if such should be encountered, in order to test the deeper sands. It was agreed that this well should be considered a prospect well and that upon testing out the territory, the water would be shut off according to recommendations to be made by this bureau.

Well No. 1, Gosnell, supplementary to deepen. P 2-115.

Approved the further deepening of the well, oil formations to be mudded and cemented in an effort to protect them from water.

Well No. 1, Gosnell, supplementary to deepen. P 2-141.

Approved certain tests to determine productiveness of oil formations.

SECTION 22.

State Consolidated Oil Co.

Well No. 2, Lloyd, supplementary to redrill. P 2-80.

Supplementary proposal submitted with reference to depth of cementing the 12½″ and 15½″ casings in line with certain provisions contained in Departmental Order No. 4 in reference to this well, was approved.

Well No. 2, Lloyd, report of cementing. T 2-35.

The report gives a record of the cementing of the 12½″ casing.

Well No. 2, Lloyd, suspension of Order No. 4. P 2-96.

Well making large amount of water and gas and some oil after drilling out bridge below 12½″ casing. Approved proposal for temporary suspension of Departmental Order No. 4 in order to allow well to produce, awaiting further developments in this area.

Well No. 2, Lloyd, suspension of Order No. 4. P 2-112.

Approved further suspension of Departmental Order No. 4, contingent upon further developments. Well still producing.

Well No. 3, Lloyd, commence drilling. P 2-53.

Approved proposed depth of water shut-off. Requested drilling reports after a depth of 2200′ had been reached.

Well No. 3, Lloyd, report of cementing. T 2-42.

The report gives a record of the cementing of the 10″ casing.

Well No. 3, Lloyd, supplementary. P 2-132.

A proposal to pump this well for a certain period for a production test was approved.

General Petroleum Corporation.

Well No. 1, Barnard, shut off. T 2-59.

Production test showed that the well was making considerable water and very little oil.

Shell Company of California.

Well No. 1, Hartman, to plug. P 2-38.

Proposal to plug bottom of well approved.

Well No. 1, Hartman, redrill. P 2-133.

Proposal to redrill this well, shutting off water above first showing of oil, as logged, was approved as satisfactory.

SECTION 23.

Shell Company of California.

Well No. 1, McGonigle, supplementary to drill. P 2-108.

A proposal of the company to waive bailing test in the 10″ water string was approved and certain specifications made for the method of deepening the well in case oil-bearing formations should be encountered.

T. 3 N., R. 24 W., S.B.B. & M.

SECTION 22.

General Petroleum Corporation.

Well No. 1, Hobson, supplementary to deepen. P 2-40.

Method of deepening with water not shut off was approved, as no oil-bearing formations were reported as having been encountered.

T. 4 N., R. 23 W., S.B.B. & M.

SECTION 33.

New Mexico Oil Co.

Well No. 1, commence drilling. P 2-68.

As this well was a wildcat well, data not sufficient to indicate the depth at which water should be shut off. Recommended that the company keep an accurate log of formations penetrated and shut off water, if encountered, before penetrating oil-bearing formations.

Well No. 2, commence drilling. P 2-83.

No water having been encountered in Well No. 1 in this vicinity and oil having been encountered at a very shallow depth, the proposal to drill this well in a similar manner as Well No. 1 was approved.

Well No. 3, commence drilling. P 2-93.

Approved method of drilling this well as proposed.

Well No. 4, commence drilling. P 2-116.

Proposal to drill with open hole to shallow oil formations was approved, due to lack of water in other and adjoining wells.

Well No. 5, commerce drilling. P 2-117.

Method of drilling into shallow oil horizon approved.

Well No. 6, commence drilling. P 2-118.

Proposal to drill this well as outlined, no water shut-off necessary for top oil horizon, was satisfactory.

Well No. 7, commerce drilling. P 2-143.

Approved proposal to drill with open hole into shallow oil formations, providing no water was encountered.

H. L. Hays.

Well No. 1, commence drilling. P 2-144.

Wildcat well. No definite data available on which to base estimate for depth of water shut-off. Recommended that water be shut off above oil-bearing formations by bridging back above such formations, if encountered, and cementing a water string, in order that these formations might be properly tested. Requested drilling reports to be filed so that further recommendations could be made if necessary, but the company has failed to comply with this request.

MISCELLANEOUS.

T. 2 N., R. 21 W., S.B.B. & M.

LEWIS RANCHO.

St. Helens Petroleum Co., Ltd.

Well No. 1, Lewis, commence drilling. P 2-13.

The company could not intelligently estimate the depth at which water should be shut off as this was a wildcat well. Proposal to keep the department informed as to operations and shut off water above any oil formations encountered during drilling was satisfactory.

LANNING RANCH.

St. Helens Petroleum Co., Ltd.

Well No. 1, Lanning, commence drilling, P 2-60.

Conditions similar to Well No. 1, Lewis, of this company reported above. The proposal to keep this office informed in case oil or gas formations were encountered was approved.

PERKINS RANCH.

Lot 46.

Joseph B. Dabney.

Well No. 1, commence drilling. P 2-17.

Data not sufficient to estimate depth of water shut-off. Recommended that each string of casing landed be cemented as a precautionary measure.

CHAPTER V.

SANTA BARBARA, SAN LUIS OBISPO, MONTEREY AND SANTA CLARA COUNTIES

By H. W. BELL, Deputy Supervisor.

The bulk of the work of this department during the year closing June 30, 1918, has been centered about development operations in the Arroyo Grande, Casmalia, Cat Canyon and Santa Maria fields. With the exception of the Santa Maria field there were fewer wells reported for drilling this year than in the preceding year. In passing upon proposals to drill wells in developed areas in the Cat Canyon and Santa Maria fields, aside from completing certain peg models, only the usual routine engineering work was necessary, because studies of structural and subsurface conditions, in both these fields, had been practically completed at the end of the last fiscal year. The Casmalia field, however, continues to present new problems in structure and water conditions.

During the year additional peg models of portions of the Cat Canyon, Casmalia and Santa Maria field were completed. These models now cover 7200 acres of proved oil land. This is an increase of 4950 acres over completions at the end of the last year. About 80 per cent of the proved and active portion of the Santa Maria-Lompoc district is now covered by peg models.

There were 31 wells reported for abandonment during the year as compared with 44 wells in the year previous. Although this indicates an apparent decline in abandonment operations it does not tell the whole story. During the previous year there was much activity among wrecking companies, and some operators, in abandoning wells in order to get casing and other material to use in drilling new wells. Long before the close of the present fiscal year available old wells for this purpose had been reduced to a minimum. Most of the present year's abandonment operations represent the wind-up on wildcat wells, started within the last two years. At least four of the wells, representing an estimated expense of $315,000, were drilled in areas in which structural and geological conditions were manifestly unfavorable and prospecting was unjustifiable from an engineering, hence, economic, point of view. In most cases, however, structural conditions and proximity to developed areas justified the expense.

At the time the Santa Maria office was opened and for a considerable period thereafter, not a single operating company in the district had an engineer in its employ for the special purpose of studying conditions with respect to indicating probable depths to shut off water and encounter oil. The burden of all such engineering work fell upon this department. It is therefore gratifying to report that three of the larger companies now have resident engineers in their employ. This is not mentioned as though entailing a shifting of work or responsibility. It is already apparent that the exchange of ideas and information, as between these engineers and members of the department, has been reciprocally advantageous.

Acknowledgment is made to the operators of the district who, with few exceptions, through their co-operative attitude, have facilitated the carrying out of the work and instructions of this department. There have been no formal complaints by any operators against their neighbors. This does not mean, however, that repair of wells in several localities is not needed.

The deputy in charge was transferred from the Coalinga office to Santa Maria in September, 1917, and up to the end of May, 1918, acted in the capacity of petroleum engineer and inspector under former deputy, R. E. Collom. He was appointed to the position of deputy when Mr. Collom was transferred to the San Francisco office, as chief deputy, in June, 1918.

Summary of Well Records.

The number of wells in this district, new, drilled or abandoned, and other data as to logs and productions of oil and water, are shown in the following tabulation:

Field	Wells listed			Logs filed	Graphic logs	Number of wells accounted for by production reports	Number of wells actually producing, according to production reports	Average daily production		Average daily production per producing well		Per cent of water
	New	Wells drilled	Wells abandoned					Barrels oil	Barrels water	Barrels oil	Barrels water	
Santa Maria	9	227	44	251	209	219	215	8,765	4,089	41	19.0	31.8
Cat Canyon	5	65	38	90	55	40	36	2,604	161	72	4.5	5.8
Casmalia	36	64	12	78	65	65	64	6.182	1,783	97	11.0	22.4
Lompoc		37	18	45	24	28	27	1,273	1,304	47	48.6	50.6
Los Alamos	2	2	6	8	1	1						
Arroyo Grande	5	14	3	8		15	12	202	20	17	1.7	9.0
Sargent	1	7	5	13		8	8	57	4	7	0.5	6.6
Summerland		138										
Miscellaneous	5	8	7	7								
Totals	63	562	133	500	354	376	362	19.083	7,364	52.7	20.3	28.0

The following table shows the totals of notices received and decisions rendered on proposed oil well operations in the various fields, during the past year, in District No. 3:

District No. 3—Field	New wells		Test of water shut-off		Deepen or redrill		Abandon	
	Notices	Decisions	Notices	Decisions	Notices	Decisions	Notices	Decisions
Santa Maria	9	13	21	20	16	19	2	2
Cat Canyon	5	6	18	22	16	20	8	8
Casmalia	36	44	83	85	38	44	3	4
Lompoc			1	2	1	3	3	7
Arroyo Grande	5	6	10	8	5	6	3	3
Sargent	1	1		1	1	1	3	5
Los Alamos	2	2	6	4			3	6
Miscellaneous	5	6	1	1	2	2	6	8
Totals	63	78	140	143	79	95	31	43

ARROYO GRANDE FIELD.

There were eight wells added to the producing list in the Arroyo Grande field during the last fiscal year. Wildcat operations in that field have not increased the proved area. The Tiber Pacific Oil Company and the California Oil Company are both operating producing wells in the only proved portion of the field.

The following table gives comparative figures for water and oil produced during June, 1917, and June, 1918:

	June, 1917	June, 1918	Increase
Total fluid	2,553	5,553	3,000
Water	75	573	498
Oil	2,478	4,980	2,502
Number of wells producing	4	11	7

CASMALIA FIELD OPERATIONS.

During the fiscal year 1917–1918 this department received 36 notices to drill new wells in the Casmalia field. During the same period 47 new wells were added to the list of producers, and only five wells were abandoned. All of the wells which were abandoned were located on the outskirts of the field, and in "wildcat" areas. The several tables accompanying this report show the amounts of oil and water produced. There are several factors which render the drilling of wells, and remedial work for control of the water in this field, uncertain. They are:

(1) The porous character of the hard oil-bearing brown shales;

(2) Absence of sand strata and difficulty of correlating blue, gray and brown shales;

(3) Difficulty of defining the location of the hot *bottom* water.

(4) The possible admittance of top water to the oil-bearing brown shales.

(5) The uncertainty of position and of the correlation of top waters.

These several factors are discussed as follows:

(1) The hard brown shales are metamorphosed marine sediments, essentially chalcedony or flint in composition. They are usually composed of alternating layers of hard and soft shale, and the whole mass seems to be creviced and fractured. They constitute a very hard, yet porous, medium. The porosity is always considerable, but is found to be quite variable in different locations. Examples of this are given elsewhere in this report. It is known that oil, water, mud and cement have found easy passage through them.

The lateral travel of both top and bottom water through these brown shales has complicated the problem of securing proper protection to the oil deposits by remedial work.

(2) It is quite certain that the contour of the contact of the brown and blue (or gray) shales does not accurately delineate the stratigraphy. However, a study of a peg model has led to the conclusion that such correlation is a rational basis for making a further study of conditions. The accompanying contour map shows the top of the hard brown shale, the upper portion of which in the western part of the field is known as the tar zone.

In several wells the positions of the top of the hard brown shale, or its equivalent, are hard to determine. This is probably due, to some extent, to the different formational names applied by the various drillers. The underground structure of the field, as shown by the contour map, Fig. 13, which is based on the logs of wells, corresponds in a general way to that accorded to it by a study of the surface conditions alone. The main anticlinal axis has a northwesterly-southeasterly trend, but this appears to be supplemented by smaller anticlinal spurs, and by domes. The existence of at least one sharp fold is shown, along which it is possible that faulting has occurred. The theory has been tentatively advanced that block faulting is probably responsible in part for the irregularity of the contact of the shale members. Aside from the foregoing, it is probable that the hardening of the brown shale has taken place along zones that are not entirely parallel with the bedding planes, and that the reservoirs of oil and gas are defined by the lines of least resistance within these zones. Hence the porosity, and not necessarily the stratigraphy, has determined the migration of oil and gas. Wherever brown shales are found in this area, such coloration is due to petroliferous saturation, and it is probable that the porous portions of bodies of shale, once blue or gray, in contact with this zone, have been similarly colored.

(3) The hot bottom water is carried by hard brown shales, which are identical in character to those carrying the oil. With the exception of one well, any parting between the two fluids has never been definitely located. When drilling in the oil measures, water must be used to hold back, or "lubricate," the heavy oil, in order to allow the tools and bailer to work properly. Although a well may be drilled too deep, the presence of this bottom water is not evident, usually, until the well has produced continuously for several weeks or longer. The following is the apparent reason for this condition:

As the head of viscous oil is removed from a well that has been drilled too deep, and as the gas pressure diminishes, the less viscous water finds easy access to the pump, and the oil is thereby held in check from entering the well. This bottom water has been known to flow from the top of a well, but only after the well had produced oil for some time. For the elimination of bottom water in these wells, successful plugging operations are often difficult. The heavy oil works into the cement, and thickly coats the walls of the hole. The setting of the cement and its bond with the walls of the hole are therefore rendered uncertain.

(4) In the western portion of the field, the policy of cementing two water strings has been followed. The upper string was cemented for the purpose of excluding the top water from the tar zone. The lower string was cemented for the purpose of separating the cool, heavy oil of the tar zone from the hot, heavy oil of the oil zone, and as an additional protection to the oil zone, in case the top shut-off became ineffective, or in case the top water was let into the tar zone by some other well.

In the eastern portion of the field, conditions are somewhat different, inasmuch as the present productive measures appear to correlate with the above-mentioned tar zone. Therefore one water string has been the rule in that area.

In the west side of the field, several water strings have been carried as low as 400 feet into the tar zone without taking any precaution, with the exception of an inadequate amount of cement, to hold the top water above the porous brown shales of the tar zone. It is true that the most conspicuous cases of this condition are shown in the first wells drilled in this area. During the drilling of these wells practically nothing was known of the underground conditions. After water has been let into the tar zone, it can no doubt travel through the porous shales to other wells, and, if the second shut-off is not effective at a well, it will pass down the hole, or around the outside of the cement, and enter the oil zone below. It is known that cementing done in these shales, without the application of mud fluid, is liable to be a failure, on account of the cement running out laterally into the formations. In several wells water has been logged in the tar zone. However, it has not been conclusively proved by pumping test that primary water exists there.

(5) In drilling some of the first wells in the Casmalia field unexpected water was found below the top shut-offs. This demonstrated that the position and number of these top waters is erratic. It is probably responsible, in a measure, for some of the first wells having their second shut-offs too deep, the object being to make certain of getting below all top water. The result of this overreaching is discussed under No. 4.

The formations being generally favorable, the operators have adopted the plan of drilling the wells, down to the first considerable shows of oil, with as little drilling water as possible. Thus in most cases they are drilled "dry," using just enough water to properly mix the drillings. By this means the location of top water is easily determinable, except when a strong flow from one water-bearing formation is sufficient to fill the hole enough to void the possible evidence of a lower water. Some wells of late have been drilled to the productive zone and thoroughly tested before final shut-off point was decided. In other cases shallow shut-offs have been made, for prospecting purposes, either by cementing or by formation shut-off, below all probable top water. Then the wells have been drilled dry to the productive zone, after which the lower shut-offs have been effected on top of bridges.

In the eastern portion of the field, one water string has been the rule, but in some cases, as described above, the operator has considered it good policy to make two shut-offs. The following is an illustration of this idea: In a new well, drilled in this way, a temporary formation shut-off was made at 396′ with 12½″ casing, to exclude all probable top water. On the notice for drilling this well it was proposed, and this department approved the plan, to mud the formations between the 12½″ and the 10″ shoes, to cement the 10″ casing, and to then remove the 12½″ casing. A 20″ hole was drilled and about 220 cu. ft. of mud was converted into mud-fluid and placed behind the 12½″ casing at the surface. The mud-fluid did not fill up to the surface. Water logged at 310′ was reported to have entered the hole at the rate of 50 bbl. per hour, and to have risen to a level of 240′. The 12½″ casing successfully excluded the top water, and the well was then drilled dry to a depth of 850′. The deputy was called, and it was witnessed by bailing test that the formation between 396′ and 850′ carried no appreciable water. Drilling was continued under the same conditions to 1595′, when it was again witnessed by the deputy that the formations encountered below 396′ were dry. The casing was moved to more adequately demonstrate this point. Later the superintendent reported that the well had been drilled to a depth of 1873′ into brown shale, with no water showing The formations below 396′ were then mudded, using about 50 cu. yds. of mud fluid. and the 10″ casing was cemented in gray shale at 1845′, using 150 sacks of hydraulic lime, followed by 200 sacks of cement.

When tested, the 10″ shut-off was approved by this department. Instead of pulling 12½″ casing as contemplated, the superintendent decided that it was good insurance to leave the casing undisturbed.

In addition to the advantage mentioned under No. 5, of drilling the wells dry, there is a distinct increase in rate of drilling over results obtained by "drilling wet." One Casmalia operator believes that the average total time of drilling his wells "dry" is only about one-half of the time consumed by the "wet" method. Another superintendent gives his idea of the average results as follows: Where a 1600′ well could be drilled "wet" in 40 days, the "dry" method would reduce the time to 30 days, effecting a time saving of 25 per cent. In so far as the mere capacity of the bit to penetrate the formations is concerned, results indicate that "drilling dry" can accomplish, under ideal conditions, as much as eight times the amount of hole possible by the "wet" process. Some of the factors which tend to minimize the value of "dry" drilling are:

(1) Caving formation, which usually necessitates carrying casing near the drill, and underreaming for same. In the "wet" method, the hole is usually drilled for several hundred feet, in this way, with open hole, using a proper size bit to obviate the necessity for underreaming;

(2) Permanent or temporary shut-offs that might otherwise be omitted. The haphazard occurrence of the different top waters sometimes makes it more economical to finish the hole at least partially "wet," in order to avoid the expense of handling casing for any other shut-offs;

(3) Heavy oil entering the hole, and necessitating the use of water to hold it back, and to "lubricate" it for a sufficiently free action of the tools. Especially is this true on the west side of the field, where the oil is as heavy as 8° Baumé gravity.

On account of the above-mentioned conditions, each well is really an individual problem for the determination of the best procedure to accomplish the drilling (*i. e.*, "wet" or "dry").

During the past fiscal year the operators of the Casmalia field were urged by the Mining Bureau to experiment with mud-laden fluid in the drilling of wells with standard tools. The porous, fractured brown shales of this area are known to constitute a medium which permits of a considerable migration of fluid whenever opportunity offers. The idea was to fill the cavities with mud fluid, and thereby build up an impervious jacket around each well. With this accomplished, the result was figured to be the sealing of the strata, and the confinement of any oil and water bodies to their original positions, and also to have the effect of keeping the cement from traveling laterally into the shale during the operation of cementing a water string.

The production of the Casmalia field is obtained by three companies, the Associated Oil Co., Doheny-Pacific Petroleum Co., and the Union Oil Co. About the first of 1918 two of these companies began using mud-fluid in an effort to avoid serious water conditions. It is yet too early to gauge the results of these operations by production reports. At about twenty wells drilled with cable tools mud has been used in varying amounts and under varying conditions. The shales adjacent to the wells have taken from 10 to 240 cu. yds. of mud-laden fluid per well, indicating a great variation in porosity. In some cases the mud was put in under an extra pump pressure of several hundred pounds per square inch, while in others the mud was simply circulated, and more mud was added around the outside of the pipe at the surface, as the mud receded. It is reported that mud was thus added as many as five times, in an effort to maintain its level at the surface, but that the desired result was not obtained. The scarcity of good mud in the vicinity added to the difficulty of the operation. The best quality obtained was taken from old sump holes.

One operating company carrying out the mudding operations persistently was not satisfied until a permanent column of mud reached the surface, but in other cases the work was not properly done, and best results could not be expected. In a few cases mud has been placed behind both water strings. In these cases, in the western part of the field, the tar zone was mudded at the final operation.

As an illustration of the beneficial results from the use of mud at Casmalia, an outline of operations of well No. 14, Soladino, of the Doheny-Pacific Petroleum Company, is given as follows: A string of 12½″ casing was cemented in blue shale at 1025′ and a string of 10″ casing was cemented at 1120′, the shoe of the latter string being at the contact of blue shale above, and brown shale below. There had been only a small amount of water found below the shoe of the 12½″ casing, and this water was apparently not active enough to show the condition of the 10″ shut-off in its true light. This shut-off seemed to be successful. There had been used 100 sacks of cement, but returns of water did not reach the surface. It was noted that the water back of the casing came within 30′ of the top. The well was drilled in and started producing, after which considerable water appeared. Bridging and testing proved that the water had broken in around the 10″ shoe. A strain was put on this pipe, and it was easily removed from the well. When the casing was examined, it was found that only about four feet of cement showed above the shoe. The cement had evidently traveled laterally and downward into the porous brown shale. Being unable to loosen the 12½″ casing, the formations below the 12½″ shoe were thoroughly mudded under pressure, using 170 cu. yds. of mud-laden fluid. The 10″ was then cemented at 1168′. When pumping in the cement, mud-fluid was displaced and overflowed at the surface, indicating that the cement went up back of the pipe. Upon testing, the shut-off was approved.

The following cases illustrate the variation of the porosity of these brown shales:

(1) Mudding operations were about to be started on a well, but, due to the fact that the formations would take but very little water under a pump pressure of 300 lbs., the mud was not used.

(2) A new well was started with rotary outfit. It was found impracticable to maintain circulation, although a large quantity of chopped rope and other material calculated to retain the mud was introduced. At a depth of about 400′ standard tools were substituted. The average condition of porosity of the hard brown shale, as noted by drilling operations, leans toward case No. 2, rather than toward case No. 1.

The following table gives comparative figures for water and oil produced during June, 1917, and June, 1918:

	June, 1917	June, 1918	Increase
Total fluid	67,433	371,184	303,751
Water	5,935	115,123	109,188
Oil	61,508	256,061	194,553
Number of producing wells	13	63	50

Water Analyses.

The use of water analyses to indicate the source of oil well waters, has afforded considerable valuable evidence in connection with the Californian fields. The accompanying table of “Chemical analyses, (fig. 14), of oil-well water of Casmalia field” shows conclusively that they are also of economic value. The most reliable distinguishing chemical characteristics of the average samples of the “top” and “bottom” waters are as follows:

(1) “Secondary alkalinity,” which shows the amount of carbonate of calcium and magnesium to be greater in the top waters;

(2) “Total dissolved solids,” which is greater in the bottom water. This condition is usually true and is explainable by the fact that the deeper water has traveled a greater distance through formations, and therefore has had more opportunity to dissolve mineral matter therefrom. This idea assumes that the top water is of meteoric origin.

(3) “Per cent of $r\mathrm{SO}_4$ in $r\mathrm{SO}_4 + r\mathrm{Cl}$, which is greater for the top water. The presence of more sulphates and less chlorides in top water is a common phenomenon in the oilfield waters of California.

CHEMICAL ANALYSES OF OIL-WELL WATERS OF CASMALIA FIELD

Sample from Well Nº.	Depth of Sample	Top Water	Bottom Water	IONIC ANALYSES PARTS PER MILLION OR MILLIGRAMS PER LITER										SPECIAL PROPERTIES				RATIOS	
														SALINITY		ALKALINITY			
				TOTAL DISSOLVED SOLIDS	$SiO_2+R_2O_3$	VOLATILE & ORGANIC	Na^+	Ca^{++}	Mg^{++}	Cl^-	SO_4^{--}	CO_3^{--}	HCO_3^-	PRIM.	SEC.	PRIM.	SEC.	% rSO_4 in rSO_4+rCl	Ratio of rCO_3+rHCO_3 to rSO_4
A.O.Co. A-101	275	✓		2615.5	187.5	60.0	715.8	8.2	18.4	498.4	78.8	36.0	1012.4	46.86	0	47.42	5.72	10.44	10.78
A.O.Co. A-42	550	✓		8789.8	91.0	110.0	2820.6	36.0	40.7	2874.2	133.3	0	2684.0	65.56	0	30.44	4.00	3.30	15.89
A.O.Co. P-42	240	✓		564.5	90.0	30.0	130.3	9.0	4.8	110.4	64.4	0	125.6	68.36	0	18.74	12.90	30.11	1.53
A.O.Co. M-4	155	✓		1902.2	39.4	50.0	377.0	67.4	64.4	214.0	250.8	0	839.2	44.96	0	20.64	34.40	46.30	2.64
A.O.Co. P-137	250	✓		1852.7	50.6	40.0	433.5	36.3	36.6	242.4	52.1	0	961.2	33.42	0	46.26	20.32	13.60	18.40
A.O.Co. M-25	330	✓		3433.4	86.0	30.0	921.1	29.2	13.9	271.0	33.6	43.0	2005.6	19.60	0	74.40	6.00	8.50	49.10
A.O.Co. M-25	760	✓		7130.6	33.8	100.9	2011.5	33.0	30.3	873.7	15.8	30.0	4001.6	27.30	0	68.30	4.50	1.30	202.00
A.O.Co. M-34	310	✓		2337.2	11.0	90.0	593.4	40.8	26.0	300.0	130.8	0	1145.6	37.30	0	48.80	13.90	24.30	6.90
A.O.Co. P-61	400	✓		9554.0	46.8	110.0	3081.6	38.4	32.8	3066.0	8.4	0	3170.0	62.50	0	34.00	3.50	0.20	305.00
D.P.P.Co. S-14	270	✓		4302.0	61.7	436.2	1036.3	86.8	105.1	1063.7	28.8	821.1	0	52.78	0	24.86	22.36	1.97	45.40
D.P.P.Co. S-37	Near Top	✓		5399.8	16.5	783.7	697.8	85.6	84.7	401.4	25.5	889.1	0	28.60	0	44.60	27.20	4.48	55.80
D.P.P.Co. S-38	175	✓		4993.6	170.2	1946.4	567.5	126.1	166.6	794.7	21.4	653.2	0	51.24	0	3.98	44.78	2.03	46.80
D.P.P.Co. S-38	280	✓		2633.0	48.7	67.0	352.0	178.8	150.0	865.0	9.9	343.7	0	48.10	25.40	0	32.80	0.89	54.60
A.O.Co.	Water Well	✓		324.5	Trace	58.0	48.7	18.9	9.5	88.0	27.4	23.6	0	55.20	24.40	0	10.20	18.95	1.39
A.O.Co. A-82	Surface Formation	✓		1492.0	2.0	55.0	297.4	77.4	132.8	388.0	30.5	484.6	0	41.80	0	5.00	53.20	5.45	25.61
			Average	3821.6	62.3	264.5	939.0	58.1	61.1	803.4	60.8	221.6	1063.0						
A.O.Co. P-21	1835		✓	6218.4	0	508.4	2157.8	86.0	20.4	2615.0	7.5	779.8	0	73.96	0	20.04	6.00	0.22	163.40
A.O.Co. A-91	Production		Probable	3615.0	35.6	195.0	1308.0	29.1	21.7	1365.0	46.7	617.4	0	65.74	0	28.88	5.38	2.50	21.20
A.O.Co. A-91	?		Probable	4460.0	33.0	262.0	1560.0	62.7	65.4	899.5	127.0	1450.4	0	36.72	0	52.14	11.14	9.50	18.20
A.O.Co. A-71	Pump 8+ 1560		Probable	5754.0	33.7	120.0	1722.4	82.8	16.4	1512.0	30.2	0	2226.0	53.80	0	39.38	6.82	1.40	57.90
D.P.P.Co.(Lease 1) 7	Production		Probable	7455.0	46.3	450.0	2755.0	28.2	18.5	3022.0	22.9	1108.0	0	69.86	0	27.76	2.38	0.57	75.40
D.P.P.Co.(Lease 1) 10	Production		Probable	10030.0	28.6	691.0	3070.0	20.7	52.0	1803.0	46.6	2608.0	0	37.34	0	58.84	3.82	1.87	89.50
D.P.P.Co. S-3	Production		Probable	4360.0	32.0	441.0	1539.0	15.2	20.2	1420.0	21.4	866.0	0	58.34	0	38.18	3.48	1.10	65.20
D.P.P.Co.(Lease 2) 5	Production		Probable	13921.0	32.3	552.0	5255.0	16.1	32.3	6546.0	16.8	1420.0	0	79.62	0	18.90	1.48	0.20	127.00
D.P.P.Co.(Lease 2) 1	?		Probable	13595.0	22.2	860.5	5020.0	12.0	22.6	6595.0	68.2	1002.0	0	84.86	0	14.03	1.11	0.75	23.60
U.O.Co. E-2	Production		Probable	9043.0	39.7	741.0	3260.0	17.6	15.9	4283.0	0	693.0	0	83.92	0	14.56	1.52	0	∝
A.O.Co. A-62	Production		Probable	6107.6	47.0	16.1	1926.6	22.1	17.3	1480.0	43.7	104.8	2450.0	49.40	0	47.60	2.90	2.10	43.00
			Average	7687.2	31.9	439.7	2688.5	35.7	27.5	2867.3	39.2	968.1	425.1						
A.O.Co. M-45	1605	Intermediate(?) Sulphur Water		12590.1	48.0	350.0	4157.5	528.0	121.2	5216.0	21.2	0	2562.0	76.30	0	17.20	6.50	0.30	98.00
A.O.Co. P-61	1370	Intermediate Sulphur Water		15133.3	70.0	460.9	4354.1	24.3	33.1	2105.9	111.9	Trace	7954.5	31.90	0	66.00	2.00	3.70	56.00
		Average of Intermediate		13861.7	59.0	405.4	4255.8	276.1	77.1	3660.9	66.5	Trace	5258.2						

Accompanying Bulletin Nº 84. California State Mining Bureau

FIG. 14.

The following is an explanation of the terms used in connection with the "special properties" shown in the table:

Primary salinity is a result of a combination of the alkalies, such as sodium and potassium, with the strong acids such as hydrochloric and sulphuric.

Secondary salinity is the result of a combination of the alkaline earths, such as calcium and magnesium, with the strong acids.

Primary alkalinity is the result of a combination of the alkalies with the weak acids, such as carbonic.

Secondary alkalinity is the result of a combination of the alkaline earths with the weak acids*.

The Shell Company of California have employed water analyses to determine the presence or absence of new water during the drilling of their well in the Newhall tract. Frequent samples were taken at the bottom and near the top of the water column in the hole, and also of the drilling water that was added from the surface. This method demonstrated the presence and approximate location of new water zones, regardless of the fact that the hole was full of water. In one case a marked decrease in sulphates and increase in carbonates indicated the presence of a new body of water.

In "wildcat" operations, or in territory where the locations of water sands or zones are erratic, this method is especially worthy of consideration. A few analyses costing about a hundred dollars may be the means of saving a string of casing, costing several thousand dollars.

Thanks are due F. G. Tickell, resident engineer of the Associated Oil Company at Casmalia, who furnished the writer with considerable data used in the table of "Chemical analyses of oil-well water of Casmalia field."

CAT CANYON FIELD.

There has been no new development of interest in the Cat Canyon field during the past year. The Pan American Petroleum Investment Corporation, which conducted the principal development operations in the year previous, met with adverse water conditions and small production in the developed area on the Teresa Bell tract. Drilling of new wells in that area has been suspended. It is the writer's opinion, however, that the tract has not been prospected to the best advantage. History of early development, by other companies, along the northerly line of the Los Alamos Rancho, bounding this tract, indicates the possibility of the existence of productive formations in the anticlinal structure whose axis almost coincides and runs parallel with the northerly line of the Bell tract.

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*For detailed information on this subject, see Bulletin No. 653, of the U. S. Geological Survey, and references mentioned therein.

In the Brooks-Stendell area in the Cat Canyon field the Brooks Oil Company and the Palmer Union Oil Company each brought in a new well. The peg model of this area indicates that the productive formations lie in an anticlinal spur, plunging northwesterly, off the north flank of the main anticline traversing the Solomon Hills.

The following gives comparative figures for water and oil produced during June, 1917, and June, 1918:

	June, 1917	June, 1918	Increase
Total fluid	74,269	90,855	16,586
Water	3,337	7,614	4,277
Oil	70,932	83,241	12,309
Number of wells producing	24	31	7

LOMPOC FIELD.

No new development has taken place in the Lompoc field. Nearly all of the proved area in this field is operated by the Union Oil Company, excepting one quarter section belonging to the Orcutt Oil Co. The Union Oil Company has producing wells extending over a strip of land, 3.6 miles in length, in the northerly end of the Purisima Rancho. The average distance between wells is 1700′. There is still room for a number of producing wells in this area. The field is not being properly protected from water. It is now producing more water than oil. The following table shows an increase of 6792 barrels of water as between June, 1917, and June, 1918, and a decrease of 2468 barrels of oil, with equal numbers of wells producing.

	June, 1917	June, 1918	Increase	Decrease
Total fluid	81,088	85,412	4,324	
Water	37,836	44,628	6,792	
Oil	43,252	40,784		2,468
Number of wells producing	27	27		

SANTA MARIA FIELD.

In the Santa Maria field the principal development of interest has taken place in the eastern portion of the field along the east-west line dividing the properties of the Union Oil Company and the Western Union Oil Company. In this area six new wells have been brought in with initial productions running as high as 1000 bbl. per day of 26 gravity oil. The production comes from the second oil zone. To date the oil is practically free from water. There has been some variance in the casing programs of the two operators drilling along this line. The question of properly protecting oil bearing formations from water under the respective programs has been the subject of two conferences between representatives of these companies and this department. The principal question involved is that of the use of cement rather than formation shut-offs. It is the writer's opinion that cement shut-offs will insure greater durability to casing. The method of drilling in this area, whether by rotary or cable tools, is a matter of minor importance, in so far as shutting off water is involved, as there is a body of nearly a thousand feet of blue shale above the second oil zone in which to land casing.

Early in the past fiscal year the Union Oil Company acquired ownership of all holdings of Pinal Dome Oil Company in the Santa Maria District.

In the older part of the field, on the Newlove, California Coast, Hartnell, Harris and Graciosa leases, the Union Oil Company deepened a number of wells from the second to third oil zone with good effect. On the Harris lease the Union Oil Company drilled well No. 3 to get production from the third oil zone. This well had not been completed at the close of the fiscal year. Some interesting developments relative to water conditions were noted in this well. These features are given in detail in the Lists of Decisions of Santa Maria field. An intermediate water apparently exists between the second and third oil zones in the area along the Newlove-Graciosa (Harris) line. A number of the earlier wells drilled to the second oil zone in this area may have entered this intermediate water. This is mentioned as an additional clue to those given under discussion of water conditions in the First and Second Annual reports[1] with relation to the flooding of second oil zone production.

The following table gives comparative figures for water and oil produced during June, 1917, and June, 1918:

	June, 1917	June, 1918	Increase	Decrease
Total fluid	461,929	414,210	----------	47,719
Water	160,205	135,501	----------	24,704
Oil	301,724	278,709	----------	23,015
Number of wells producing	196	208	12	----------

SARGENT FIELD.

The Watsonville Oil Company has resumed control of operations in the Sargent field. The Sargent Ranch property was operated, during the year previous, by the Gilroy Oil Company.

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[1] First Annual Report, Bull. 73, Cal. State Mining Bureau, Water Conditions Santa Maria Field, pages 198–202.
Second Annual Report, Bull. 82, Cal. State Mining Bureau, Water Conditions Santa Maria Field, pages 202-204.

The following table gives comparative figures for water and oil produced during June, 1917, and June, 1918:

	June, 1917	June, 1918	Increase	Decrease
Total fluid	1,770	1,700		70
Water	120	100		20
Oil	1,650	1,600		50
Number of wells producing	6	8	2	

REPORT ON SOLADINO-ARRELLANES GROUP OF WELLS.
DOHENY-PACIFIC PETROLEUM COMPANY.
ASSOCIATED OIL COMPANY.
CASMALIA FIELD.

By R. E. COLLOM, Deputy Supervisor, to R. P. McLAUGHLIN, State Oil and Gas Supervisor.

The following is an analysis of operations as to drilling, formations, protective work and productions in the Soladino-Arrellanes line wells, Casmalia field, owned respectively by the Doheny-Pacific Petroleum Company and the Associated Oil Company.

The wells included in the group are:

Doheny-Pacific wells:

Soladino Nos. 1, 2, 3, 4, 5, 6, 7, 8, and 9.

Associated wells:

Arrellanes Nos. A-91 (old A-2; [P. O. T. No. 1]).

A-80 (old No. 4), A-81 (old No. 5), A-71 (old No. 6), A-61 (old No. 7).

The following table gives the initial drilling dates, dates of completion, total drilled depth, etc., of each of the wells in the group:

SOLADINO-ARRELLANES LINE WELLS, JANUARY 1, 1918.

Well number	Drilling started	Drilling completed	Total depth	Casings		Cemented		Oil strings		Tubed to		Plugs		
				15½-in.	12½-in.	10-in.	8¼-in.	Size	Amount	Size	Amount	From	To	Date
Soladino, 1	10/ 3/16	2/ 7/17	1,865	C-200	C-1,121			10	1,384	4½	1,342			
Soladino, 2	10/ 9/16	12/28/16	1,565	C-200	C-1,215			10	1,538	4½	1,417			
Soladino, 3	10/12/16	2/14/17	1,860	C-200	C-1,141	C-1,430				4½	1,481	1,860	1,650	10/ 6/17
Soladino, 4	10/18/16	3/12/17	1,850	C-843	C-1,430					4½	1,482	1,850	1,650	8/24/17
Soladino, 5	10/27/16	2/ 3/17	1,720		C-900	C-1,465				4½	1,457			
Soladino, 6	2/ 4/17	5/16/17	1,633		C-745	C-1,358		8¼	1,404	4	1,625			
Soladino, 7	1/25/17	9/12/17	1,799		C-805	C-1,383		8¼	1,536	4½	1,552			
Soladino, 8	2/ 2/17	12/—/17	1,925		C-1,100			10	1,800	3	1,773			
Soladino, 9	3/14/17	8/21/17	1,650		C-1,420	C-1,524				4	1,550			
Arrellanes, A-61	8/ 2/17	11/24/17	1,640		C-857	C-1,330				4½	1,360			
Arrellanes, A-71	3/10/17	6/ 8/17	1,632		C-825	C-1,410				4½	1,560			
Arrellanes, A-80	8/13/15	4/12/16	1,852		C-739	C-1,430				4½	1,360	1,852	1,740	11/30/17
Arrellanes, A-81	2/24/17	7/ 4/17	1,595		C-790	C-1,375		8¼	1,500	4½	1,397			
Arrellanes, A-91	3/21/04	4/ 3/05	2,485			C-667	C-1,365			*8¼		1,920	1,720	12/15/17

*Cemented, not yet tubed.
C=cemented.

Development.

Well No. A-91 was the first well drilled in the group. The drilling was done by the Producers Oil and Transportation Company. The well was not put on production, after being drilled to a depth of 2485 feet, because the oil, logged as asphaltum, was not marketable in 1905.

The Casmalia Syndicate took over the Arrellanes property and well A-91 in 1915. A new well, No. A-80, was drilled and the old P. O. T. well, No. A-91, was redrilled. Well No. A-80 was completed April 12, 1916, at a depth of 1852′, and showed an initial production of about 400 bbl. of 8.5 gravity. The well was not pumped for more than a few days at a time because there was no market. The production showed only a small amount of water during these intermittent productive periods. Continuous production at a later date gave radically different results.

In October, 1916, the Doheny-Pacific Petroleum Company started drilling Soladino wells Nos. 1, 2, 3, 4, and 5 along the Soladino-Arrellanes line. These wells, see index map on cross-section attached hereto, are 300′ apart and 150′ from the line.

Drilling was completed on Soladino well No. 1 on February 7, 1917, at a depth of 1865′. The company's records state that from February 17 to February 28, 1917, the well averaged 500 bbl. daily of clean oil. On March 1, 1917, the well produced 1800 bbl. 10.5 gravity oil and on March 2 the production rose to 7000 bbl. and showed some water. On March 3 the production declined to 1600 bbl. fluid and on March 4 the production was 1600 bbl. fluid, showing about equal parts of oil and water. The well was then shut down for one day and the following is a record of the fluid production for March 6 to 31, inclusive:

Date	Bbl. fluid	Per cent water
March 6	1,000	Little water—no cut.
7	1,000	Little water—no cut.
8	900	Little water—no cut.
9	900	40 per cent.
10	930	40 per cent.
11	1,000	50 per cent.
12	1,100	60 per cent.
13	1,100	60 per cent.
14	1,100	60 per cent.
15	1,000	11 per cent, a.m. test. 25 per cent, p.m. test.
16 (Well shut down to March 26).		
27	800	No water.
28	800	No cut—some water.
29 (Shut down).		
30 (Shut down).		
31	850	Into sump—no water.

It was thought at this time that the water was drilling water, as large quantities had been wasted into the formations in drilling this well.

However, the foregoing history of the initial productive period of Soladino well No. 1 is typical, as will be shown later, of that of the following other wells of the group:

Soladino wells Nos. 3, 4, 5 and 7, and
Arrellanes well No. A-80,

and it has since been concluded that the water being produced is not drilling water.

Drilling Conditions.

As a basis for study of the conditions in this group the formations entered by the wells are divided into three zones, namely, Water Zone, Tar Zone and Oil Zone. These divisions and the respective zone thicknesses are shown on the cross-section attached hereto.

The paramount difficulty in the identification of formations entered by the drill in the Casmalia field lies in the fact that all formations are shale. Of course the shale is of varying degrees of hardness. There are places in which caves or ''rotten shale'' occur. When certain wells were being drilled with hole kept filled with drilling water, large quantities of water ran away into these formations. With the exception of the ''Shell'' at the top of the Oil Zone, which seems to be fairly persistent in this group, formations stratigraphically equivalent are hard to identify. When the Tar and Oil zones are entered the problem of proper formational designation becomes more complicated as both tar and oil, because of their heavy gravity, follow the drill and contaminate results. Under these conditions, granting the possibility of separate oil and water strata in the lowest formations thus far entered, the companies have found no practical way in which the drill, or bailing operations during drilling, can register the passing from oil formation to water formation, or the reverse.

Lately, as little drilling water as possible has been used in drilling operations. In fact the holes have been drilled practically dry, perhaps using one barrel of water in order to make mud of the cuttings. This method has been adopted in order to avoid the wasting of large quantities of drilling water into productive zones and also with the hope of being able to tell through the rise of fluid, if the drill enters a water stratum.

Recent operations in cementing a string of 12½″ casing at 920′ in well No. A-52[1] illustrate the difficulties attendant upon operations in these shale bodies.

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[1] Although this well is not in the group under consideration, it is in the next line of wells west of the Arrellanes wells being discussed. Cemented January 8, 1918.

This well was drilled dry. That is, while drilling with open hole, only enough water to mud cuttings was dumped in bottom with a bailer. When casing was started into the hole the necessary water was run in from surface. Careful watch was kept of operations. Apparently no water stratum was entered in drilling to the depth of 920′.

At 920′ an attempt was made to cement a string of 12½″ casing with 150 sacks by the Perkins process. The casing was full of water prior to the entry of cement. The water was displaced from the casing and also the cement fluid with very little pump pressure and without fluid returns outside the casing at the surface.

On the day following this operation 100 sacks of cement were pumped into the hole outside the 12½″ casing through a string of 620′ of 1″ pipe. It was stated that returns showed continuously at the surface during this operation.

From the fact that there was no water found in drilling this well and that the hole was only 6′ ahead of the shoe, when the well was tested for shut-off, one would naturally expect that, after the hole had been bailed dry and allowed to stand for 12 hours, no water would show in the hole. However, when the bailing test was made, the hole was found to contain 230 gallons of water. Subsequent tests showed decrease in the amount of water collecting in the hole, and it was concluded that the water came from shales adjacent to the shoe where it had been forced during cementing operations.

It is obvious from the foregoing that conditions in these shales call for something more than the usual cementing operations.

Shut-offs.

Stratigraphic uniformity in the matter of water shut-offs is a vital necessity in a proper protective program in this group. There was very little definite information available when the first five Soladino wells were drilled other than the casing program adopted, and in later operations consistently adhered to, by the Casmalia Syndicate in well No. A-80.

In this well a string of 12½″ casing was cemented at a depth of 739′ above the first ''tar show'' at the top of the now called Tar Zone, in order to exclude water above this depth. The well was then drilled through the Tar Zone. At a depth of 1420′ the drill entered a hard shell and at 1440′ entered a hot oil stratum at the top of the oil zone. Subsequent drilling has showed the foregoing to be the principal definite segregations. A basic correlation has therefore been made through the shells, logged at the top of the oil zone, in the various wells shown in the attached cross-section.

Stratigraphic Datum.

Parallel to this line of correlation at the top of the oil zone, a line has been drawn through derrick floor elevation, that is, zero depth from surface, at Soladino Well No. 1. This well, from peg-model evidence and the cross-section of the group, appears to be very close to the crest of the anticlinal structure. The line, so drawn, is called Stratigraphic Datum.

Progress Chart.

The progress chart, attached hereto, drawn with respect to depths and time, shows all depths, from initial drilling dates to completion, computed and plotted with respect to stratigraphic datum. On this chart, lines of correlation become horizontal lines and the status of any group of operations, as regards stratigraphic uniformity, for any given date, may be studied easily.

In order to get the actual depth below surface for any well on any date it is necessary to add the distance from derrick floor to stratigraphic datum. The necessary correction for each well is shown on the chart.

Composite Graphic Log.

At the left end of the chart is a composite graphic log of the wells in the group. All water-bearing formations logged in the group are shown. A number of the water strata, logged in various wells, are stratigraphically coincident in the composite log. It is obvious, because of the intimate relationship of the wells, that the knowledge or suspicion of any source of water in any well of the group should be considered in connection with the water problems of all other wells of the group.

Original Program for Operations.

At a meeting in the Santa Maria office of this department on the afternoon of March 28, 1917, at which the following representatives of operators in the Casmalia field were present:

Mr. W. Canfield, Associated Oil Company,

Mr. T. A. Collins, Doheny-Pacific Petroleum Company,

Mr. M. A. Kerr, Pinal Dome Oil Company (now U. O. Co.),

Mr. F. Marsh, Casmalia Syndicate (now A. O. Co.),

the following points were discussed relative to operations by the respective companies in the Casmalia field:

(1) Proper depth to carry top water string.

(2) Productive value of brown shales, lying between 750 and 1450 foot levels, on the Soladino-Arrellanes line.

(3) Probable origin of water in the tar zone, whether drilling water, of which the shales consume large quantities, or water stored in crevices in the shales.

(4) Should another string of casing be landed and cemented in the shell at 1450′ before going into the oil zone proper.

It was considered to be of primary importance to cement a string of casing in the big shell, mentioned in item 4, or in some formation of a suitable nature stratigraphically equivalent thereto, in order to protect the oil zone.

There was believed to be a variation in the productive quality of the brown shale body, now called the tar zone, mentioned in item 2, and, in order to conserve any production in the tar zone a top-water shut-off should be made in suitable formation near the top of the tar zone.

In case, however, further drilling of wells demonstrated that there is a considerable area over which the tar zone is not productive, then, it was concluded, a string of casing could be carried to the big shell, mentioned in item 4, and cemented there, using *sufficient* cement to seal all formations through the tar zone so that there would be no possibility of top water being carried down below the stratigraphical points of shut off in other wells, and thus increasing the water content of the tar zone.

There is little variation from the foregoing in the problems that confront the operators at this time. There is the added problem of the appearance of large quantities of water in the production of certain wells, as already illustrated from the initial behavior of Soladino No. 1. The probable source of this water is discussed later.

A study of the progress chart for operations after April 1, 1917, will show to what extent the interested parties have followed the understanding as to proper protective measures developed in the conference of March 28, 1917.

Tests of Tar Zone.

In order to determine the productive value of the tar zone the Associated Oil Company suspended drilling at depths within this zone after, in each case, making an upper water shut-off in wells Nos. A-61 and A-71 and pumped them for test.

The following are the results of these tests:

Test in A-61—September 26-October 9, inclusive: See progress chart.
September 25: Depth of hole 1450′, string of 12 cemented 857′.
September 26: Pumping for test, oil and emulsion.
Gravity, 8.1 Baume.

	Barrels oil	Barrels water
September 27	168	32
28	184	16
29	138	12
30	71	4
October 1	71	4
2	72	3
3	69	6
4	92	8
5	86	14
6	89	11
7	89	11
8	88	12
9 (Rods parted, oil coming in 1050′ to 1100′. Hole caved at 1100.′)		
10 (End of test.)		

Test in A-71—April 24-May 1, inclusive: See progress chart.
April 27: Depth of hole 1411′, string of 12½ cemented 825′.

	Barrels fluid per day	Barrels water
May 1	12	12
2	12	12
3	5	5
4	5	5
5	5	5
6	5	5
End of test.		

NOTE.—Drilling was suspended on A-81 at 1377′, during the time of testing A-71.

It will be noted from the foregoing that well No. A-61 showed a considerable production from the tar zone. This production is very heavy, however, 8.1 deg. Baume, and, although it is advisable to conserve the oil, it undoubtedly should be segregated from the production of the oil zone which, if it were not for the fortunate advantage of coming hot from the ground (130 to 140° F.) would be difficult in itself to handle.

Production.

The following is a summary of the average production per well per day, in oil and water, of the various wells in the group, to January 1, 1918:

SUMMARY OF MONTHLY PRODUCTION REPORTS.

Doheny-Pacific Company, Casmalia Field.

Year 1917	Soladino No. 1				Soladino No. 2				Soladino No. 3			
	Oil, barrels daily	Gravity	Water, barrels daily	Days producing	Oil, barrels daily	Gravity	Water, barrels daily	Days producing	Oil, barrels daily	Gravity	Water, barrels daily	Days producing
February	416	10.5	17	12	403	10.5	17	25	361	10.5	15	8
March	951	10.5	478	17	594	10.5	13	26	595	10.5	51	16
April	349	10.5	481	10	515	10.5	8	30	524	10.5	56	5
May	250	9.6	51	10	452	9.6	22	31	500	10.5	108	17
June	325	9.4	41	23	381	9.4	19	29				
July	206	9.4	48	28	250	9.4	36	20	228	9.4	67	14
August	208	9.4	57	28¼	486	9.4	10	3¾	166	9.4	48	22¼
September	249	9.4	98	24¼	437	9.4	22	24½	64.7	9.4	487	10½
October	286	9.7	66	30½	407	9.4	27	31	234	9	151	6½
November	277	9.2	74	29½	374	9.3	20	29½	219	9	91	13¼
December	266	9.4	83	31	377	9.4	23	31	249	9.2	164	14⅓

Doheny-Pacific Company, Casmalia Field.

Year 1917	Soladino No. 4				Soladino No. 5				Soladino No. 6			
	Oil, barrels daily	Gravity	Water, barrels daily	Days producing	Oil, barrels daily	Gravity	Water, barrels daily	Days producing	Oil, barrels daily	Gravity	Water, barrels daily	Days producing
April	407	10.5	142	16	678	10.5	39	15	------	------	------	------
May	118	15.5	525	17	350	10.5	136	19	400	10.2	55	11
June	------	------	------	------	------	------	------	------	522	10	62	30
July	71	9.4	51	20	------	------	------	------	401	10	55	31
August	9	9.4	32	8½	328	9.4	31	22¾	391.5	10	57	29¾
September	302	9.4	109	13½	299	9.4	429	17¾	432	9.4	71	28¾
October	304	9.2	88	18	282	9.2	119	14	440	9.6	69	30½
November	287	9.2	82	26¼	259	9.6	117	18½	403	9.6	93	29½
December	253	9.3	125	27¾	213	8.8	166	26⅔	432	9.8	88	30½

Doheny-Pacific Company, Casmalia Field.

Year 1917	Soladino No. 7				Soladino No. 8				Soladino No. 9			
	Oil, barrels daily	Gravity	Water, barrels daily	Days producing	Oil, barrels daily	Gravity	Water, barrels daily	Days producing	Oil, barrels daily	Gravity	Water, barrels daily	Days producing
May	160	10.4	139	7	------	------	------	------	------	------	------	------
June	151	10.4	43	8	------	------	------	------	------	------	------	------
August	------	------	------	------	------	------	------	------	396	10	23	7
September	350	9.4	89	11½	------	------	------	------	405	9.4	43	29¾
October	337	9.6	96	26	------	------	------	------	332	9.8	126	24
November	215	9.4	105	15½	24	10	81	12	192	9.8	198	19
December	244	9.5	88	21¼	35	9.2	85	17	214	8.5	238	31

Associated Oil Company, Casmalia Field.

Year 1917	Well No. A-61				Well No. A-71				Well No. A-80			
	Oil, barrels daily	Gravity	Water, barrels daily	Days producing	Oil, barrels daily	Gravity	Water, barrels daily	Days producing	Oil, barrels daily	Gravity	Water, barrels daily	Days producing
June	------	------	------	------	450	9.8	50	4½	400	------	------	------
July	------	------	------	------	397	9.8	83	10	419	------	32	19⅓
August	------	------	------	------	410	9.8	90	10	510	------	24	10
September	------	------	------	------	370	9.8	20	6	416	------	11	2⅓
October	------	------	------	------	434	9.8	20	15	369	------	152	14
November	------	------	------	------	425	9.8	75	6	60	------	540	7
December	380	99	20	30	236	9.8	264	12	330	8.2	20	9

Associated Oil Company, Casmalia Field.

Year 1917	Well No A-81				Well No. A-91			
	Oil, barrels daily	Gravity	Water, barrels daily	Days producing	Oil, barrels daily	Gravity	Water, barrels daily	Days producing
October	473	------	27	10	------	------	------	------
November	491	8.6	9	12	------	------	------	------
December	469	9.4	31	28	269	------	269	11

Gravity of Oil.

Because much of the oil is heavier than water, in corrected gravity 8.2 to 9.8° Baume, there has been some speculation as to the probable relative positions of oil and water in these wells. It is known that in the sump holes it often happens that water will be on top of the oil. Considering the high temperature of the oil while in the wells, however, resulting in an increase in volume, and the fact that there is considerable gas mixed with the oil, there would seem to be little question but that the oil will rise to the top of any water in the wells.

Sources of Water.

The source of the large quantities of water, shown on the production reports, has not yet been satisfactorily determined.

Some of the representatives of both companies are inclined to the opinion that most of the water, showing in production, comes from the water zone, that is, from known water strata above or in the tar zone.

If such is the case this water must enter the wells through:

(1) Faulty shut-offs.

(2) Carried down behind a water string into a fracture zone and thence working its way through crevices and fractures, around and below the shut-off, into the oil zone.

(3) Lack of uniformity in shut-offs. For example, water is carried to a much greater depth, with 12½″ strings, in Soladino wells Nos. 1, 2 and 3 than in Soladino wells Nos. 4 and 5, or Arrellanes wells A-61, A-71, A-80, A-81.

The production record of Soladino well No. 2, however, does not indicate that any great amount of water has been so carried to the lower oil formations.

On the contrary, it lends support, along with the following evidence, to the probability that the large quantities of water are coming from the bottom of the oil zone.

Soladino Well No. 2 is one of the shallowest wells in the group. It has always been a comparatively clean producer.

Soladino Well No. 1, as has already been shown, and reference to the foregoing production reports will give later details, produced large quantities of water during portions of March and April, 1917.

On April 18, 1917, the work of bridging this hole, for the purpose of cementing a string of 10″ casing, stratigraphically uniform with other shut-offs near the shell at the top of the oil zone, was started. On May 1, 1917, this hole had been bridged to 1556′. The 10″ casing has not been cemented to date, although it is the company's intention, at this writing, to plug the well in bottom and cement the 10″ casing, later.

The well was again put on pump in May, 1917, and the subsequent record is for production of fluid supposedly taken from above the bridge.

It will be noted that since the well was bridged the water production has greatly decreased. It therefore would appear that much of the water produced in March and April, 1917, came from a depth greater than 1556 feet (top of the bridge). It is possible that some, if not all, of the water now coming into the well, has its source in the water zone, back of the 12½″ casing. There is also the possibility that part of the production, showing in the well, comes from below the bridge, if the bridge is not secure, and that the bridge exerts sufficient back pressure to control the fluid below a depth of 1535′ and hold back most of the water which usually appears when any of the deeper wells are produced unrestrainedly for a considerable length of time. There appears to be a condition in which the oil immediately available to a hole from its surrounding reservoir breaks in.

The following portion of a production record of Soladino Well No. 7 is typical of the behavior of the wells that produce large quantities of water:

	Bbl. oil	Bbl. water
October 18	360	40
October 19	240	60
October 20	90	10
October 21	50	*
October 22	336	14
October 23	160	240

*Started flowing water. Shut down.

Although there are no data, as to dates at hand, it is known that Arrellanes Well No. A-80 suddenly turned to large water production the first time it was pumped for a number of days and that after the well was shut down and pumping again resumed it produced clean oil for a time.

In each of the cases of this kind the water produced was hot. Temperature readings made at lead-line in Soladino Wells No. 3 and 4, under similar behavior, showed 142 and 138 deg. Fahrenheit, respectively.

Analyses of Water.

Chemical analyses have been made of a number of samples of the hot water. Samples of water taken from shallow depths, in the water zone have also been analyzed, although none of the later type have been taken from wells in the line-group.

The following are the results of some of these analyses in grains per U. S. gallon:

Hot Water.

Well number	Depth (feet)	Total solids	Sodium carbonate	Sodium chloride	Sodium sulphate	Magnesium carbonate	Magnesium chloride	Calcium carbonate
Soladino No. 3	--------	254.40	82.10	136.83	1.53	3.91	none	2.33
Soladino No. 4	--------	220.00	76.00	141.00	2.10	--------	-------	*
Arrellanes A-91	--------	211.48	54.09	131.56	3.56	4.14	none	4.25

Water Zone.

Well number	Depth (feet)	Total solids	Sodium carbonate	Sodium chloride	Sodium sulphate	Magnesium carbonate	Magnesium chloride	Calcium carbonate
Soladino No. 14	270	250.86	44.64	102.25	2.48	21.25	none	12.63
Soladino No. 38	175	281.12	5.58	76.41	1.85	33.67	none	18.36
Soladino No. 37	180	314.80	57.04	38.59	2.21	17.13	none	12.45

*Incomplete.

A close resemblance will be noted in the contents of the three "Hot Water" samples, also in the contents of the three "Water Zone" samples. Casual inspection indicates that they are two different types of water. This is especially noticeable in the difference in the magnesium and calcium carbonate content of the two types. It remains, however, for the chemist to determine whether or not waters of the type from the "Water Zone," moving down through the tar and oil formations, would be transformed chemically into the "Hot Water" type with the possible evolution of the rather extraordinary amount of heat. Such a transformation would be necessary, in order to satify the theory that the large quantities of hot water are supplied from the strata in the water zone.

Plugs.

A study of the progress chart, attached hereto, will show that a number of the wells, namely, Soladino No. 3, Soladino No. 4, Arrellanes A-80, and Arrellanes A-91 have been plugged in bottom with the hope of excluding the large quantities of hot water.

That these plugging operations have not instantly benefited these particular wells can be explained by a study of the character of the oil zone. The shales are fractured or creviced. (As an illustration, mud, used to establish circulation in Soladino No. 5, when the well was bridged to cement a string of 10″, appeared in adjoining wells.) If water is present in large quantities in the lower part of the oil zone, then, as long as the bottom of any well lies open to this water the production of all the deeper wells of the group will continue to be affected.

Remedial Work.

Therefore in order to systematically eliminate the possible water sources the following program should be followed:

(1) All wells in the group should be plugged to a uniform stratigraphic position. The present production in Soladino No. 1 is probably coming from above 1535 feet and in Soladino No. 2 from above 1565 feet, and this is an indicator as to proper plugging depth.
(2) A stratigraphically uniform shut-off should be made in all wells at the bottom of the tar zone.
(3) Steps should be taken to remedy the discrepancies in uniformity of shut-off at the top of the tar zone.

Operations under the first two items have already been recommended, for various wells, by this department.

Mud Seal.

It is the deputy's opinion that in future work in the group attempts should be made to build mud, by pumping mud laden fluid under pressure, into the creviced, fractured, cavy and rotten shales, which take large quantities of water and undoubtedly become channels for percolation and the migration of waters, from their native formations, at random through the area.

The Doheny-Pacific Petroleum Company is using hydraulic lime to a large extent in present cementing operations. No hydraulic lime was used in any of the wells of the group under discussion. The hydraulic lime fluid is pumped ahead of the cement fluid. It goes into the well and back of the casing under very little pump pressure. Usually, during the placing of the lime and cement fluid, complete water returns are gotten at the top of the casing. Under such conditions the best that can be said for the lime is that, when it sets, it will make a veneer on the walls of the hole and possibly assist in producing a bond with formation for the cement which follows it.

Without applied pressure very little lime or cement will find its way into the crevices and fractures, unless, of course, as in the case of A-52, already mentioned, circulation with returns can not be established. And, in that case, the fact that water was returned, on testing, from formations near the shoe shows that the sealing effect of cement, wasted into formations while cementing, was practically negligible.

The crevices and fractures should be filled, and rendered impervious, prior to cementing. The mudding operation should be immediately followed by the cementing operation, an excess of cement fluid being used, so that the first of the cement fluid will displace the mud between the casing and the wall of the hole. In the mudding operation it might be necessary to use sawdust or some other material with the mud, to assist in establishing a clog or filter for the accumulation of the clay in the porous formations.

Index of Operations.

The following is an index to the various reports which have been issued by this department with reference to operations in the Soladino-Arrellanes line wells, to January 1, 1918:

Report No.	Date	Proposal	Conclusion
Soladino No. 1—		Shut-off	
B-30	Oct. 31, 1916	Shut-off	Passed
B-41	Dec. 14, 1916	Bridge	Passed
BB-63	April 13, 1917	Cement 10 inches	Approved
Soladino No. 2—		Shut-off	
B-31	Oct. 31, 1916	Shut-off	Passed
B-40	Dec. 14, 1916		Passed
Soladino No. 3—		Shut-off	
B-32	Oct. 31, 1916	Shut-off	Passed
B-43	Dec. 14, 1916	Bridge	Passed
BB-87	May 31, 1917	Cement 10 inches Plug bottom	Approved
P 3-37	Oct. 6, 1917	Pumping test	Approved
P 3-75	Dec. 7, 1917		Not passed
Soladino No. 4—		Shut-off	
B-39	Dec. 14, 1916	Bridge and cement 12½ inches	Passed
BB-86	May 31, 1917	Plug bottom	Approved
P 3-17	Aug. 24, 1917	Pumping test	Approved
P 3-76	Dec. 1, 1917		Not conclusive
Soladino No. 5—		Shut-off	
B-42	Dec. 14, 1916	Bridge and cement 10 inches	Passed
BB-88	May 31, 1917	Pumping test	Approved
P 3-78	Dec. 8, 1917		Recommended plug bottom
Soladino No. 6—		Shut-off	
B-69	Mar. 17, 1917	Shut-off	Not passed
B-88	April 27, 1917		Passed
Soladino No. 7—		Shut-off	
B-60	Mar. 1, 1917	(Drill ahead for pumping test)	Passed
BB-66	April 21, 1917	Pumping test	
P 3-79	Dec. 8, 1917		Recommended bridge and test shut-off. Also plug bottom
Soladino No. 8—		Shut-off	
T 3-25	Aug. 31, 1917	Pumping test	Not passed.
P 3-81	Dec. 8, 1917		Recommended shut-off at top of oil zone
Soladino No. 9—		Shut-off	
T 3-16	Aug. 16, 1917		Passed
Arrellanes A-61—		Shut-off	
T 3-29	Sept. 10, 1917		Passed
Arrellanes A-71—		Shut-off	
B-79	April 12, 1917	Shut-off	Passed
B-96	May 31, 1917	Plug bottom	Passed
Arrellanes A-80—			Approved
P 3-59	Nov. 12, 1917		
Arrellanes A-91— (Old P. O. T. No. 1)		Redrill	
BB-41	Oct. 23, 1916	Cement 10 inches	Approved
		Shut-off	
B-49	Jan. 6, 1917	Cement 8¼ inches.	Passed
B-95	June 29, 1917	Plug bottom	Approved

DECISIONS.*

CAT CANYON FIELD.

T. 9 N., R. 32 W., S.B.B. & M.

SECTION 30.

Palmer Union Oil Co.

Well No. 2, Stendell, alter casing. P 3-30.

Proposal to cut off 6¼″ oil string at 2600′, approved.

Well No. 3, Stendell, abandon. P 3-58.

Following procedure recommended:

(1) Put cement plug inside of 6¼″ casing between depths of 2590′ and 2645′, to seal perforations.

(2) Cut off 6¼″, one joint above bottom of 8¼″, 2120′, or as near that depth as it is practicable to cut, and put cement plug in the 8¼″, on top of 6¼″ cut-off.

(3) Put cement plug on top of all other strings of casing that are cut off for removal.

Well No. 4, Stendell, shut off. T 3-31.

Shut-off satisfactory.

Union Oil Co. of California.

Well No. 3, Fleisher, shut off. T 3-73.

Shut-off satisfactory.

United Western Consolidated Oil Co.

Well No. 3, drill.

Proposed depth of shut-off approved.

SECTION 31.

Associated Oil Co.

Well No. 4, plug. P 3-147.

Company's proposal to plug this well by stages, in order to eliminate water and be able to test for production, approved.

Brooks Oil Co.

Well No. 2, abandon. P 3-71.

Supplementary proposal to cancel notice of intention to abandon and remove 10″ casing above 1100′, and make further trial of the well for oil production, approved.

Well No. 3, drill. Report P 3-99.

Proposed depth of shut-off, 2300′, approved.

Well No. 3, shut off. T 3-105.

Shut-off satisfactory.

Union Oil Co. of California.

Well No. 1, Santa Maria Enterprise, shut off. T 3-47.

Shut off approved, with the understanding that drilling will not proceed deeper than 2000′ until statement of results of production test between present depth of 1652′ and 2000′ is filed with this department.

Well No. 1, Santa Maria Enterprise, redrill and cement. P 3-85.

Proposal to cement string of 6¼″ casing at 2010′ approved.

Well No. 1, Santa Maria Enterprise, shut off. T 3-81.

Shut-off satisfactory.

T. 9 N., R. 33 W., S.B.B. & M.

SECTION 23.

Santa Maria Oil Fields, Inc.

Well No. A-1, redrill. P 3-60.

Proposal to redrill approved on the following conditions:

(1) Run casing tester in 8¼″ casing to test for leaks.

(2) If 8¼″ casing does not leak, build bridge at depth of 2500′ and make test

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*Where no report number is given Decision made on Form No. 113.

for water shut-off of 8¼". If it appears that the water is effectually shut off with the 8¼" casing, it will not be necessary to redrill with 6¼", as proposed.

(3) If water is not shut off with 8¼" casing, redrill with 6¼" casing and land and cement near bottom of blue shale body logged between depths of 2400 and 3038′.

(4) If, as in 3, the 6¼" casing should be cemented, notify deputy for test of water shut-off.

Well No. A-1, shut off. T 3-113.

Shut-off satisfactory.

Well No. 2, alter casing. P 3-52.

Proposed to shoot pocket for cement and put in a string of 6¼" casing and cement same. Proposal approved with recommendation that 6¼" casing be cemented near bottom of blue clay logged between depths of 2600 and 3016′.

Well No. 2, redrill. P 3-65.

Proposal to drill down and land 4¼" oil string, and make pumping test to determine efficacy of water shut-off, approved.

Well No. 3, redrill. P 3-7.

Proposal to redrill with 6¼" casing to top of oil sand, cement off water, and then drill through oil sand with 4½" casing, finishing with 4½" liner, approved, with recommendation that the 6¼" casing be cemented at a depth of at least 10′ greater than 8¼" was cemented, owing to the fact that the 8¼" was apparently cemented below the top of the producing oil sand.

Well No. 3, redrill. P 3-43.

Proposal to cement 6¼" at 2985′, account of encountering oil sand at 2990′, approved.

Well No. 3, redrill. P 3-61.

Proposal to drill down and land 4½" oil string, and make pumping test to determine efficacy of water shut-off, approved.

Well No. 8, shut off. T 3-17.

Shut-off satisfactory.

SECTION 26.

Palmer Union Oil Co.

Well No. 5-A, abandon. P 3-10.

Proposal to abandon approved.

Palmer Union Oil Co.

Well No. 5-A, test plug. P 3-18.

Bridge and cement plug found satisfactory.

Well No. 5 shut off. T 3-78.

Shut-off satisfactory.

Well No. 5, shut off. T 3-106.

Relative to shut-off with 12½" casing, covered in report-T 3-78, it later developed that there was a leak in the casing and it became necessary to make shut-off with 8¼" casing. Test for water shut-off satisfactory.

Well No. 5, drill. P 3-173.

Supplementary proposal to sidetrack 8¼" casing and cement 10" at about 2600′, approved.

Well No. 5, redrill. P 3-186.

Proposal to plug hole and move derrick 24′ and drill another hole with same designation, approved, with the recommendation that a neat cement plug be placed in contact with formations from 1204′ to 1184′, and that 12½" be plugged from 1184′ up to 1169′.

Well No. 6, drill. P 3-142.

Proposed depth of shut-off approved.

Union Oil Co.

Well No. 3, Blochman, redrill. P 3-165.

Proposal to redrill from bottom of 10" approved, with the recommendation that care be taken not to disturb the 10" water string.

Union Oil Co.—Continued.

Well No. 9, Blochman, drill. P 3-4.

Supplementary notice requesting recommendation as to point of landing 8¼″. Recommended that the string of 8¼″ casing be cemented at a depth of 2915′, to make shut-off stratigraphically uniform with 8¼″ shut-offs in Pinal Dome wells 7 and 8, Blochman Lease, and about 40′ lower than the shut-off of the Santa Maria Oilfields, Inc., in Well No. B-1 (Section 27).

Well No. 9, Blochman, shut off. T 3-35.

Shut-off satisfactory.

SECTION 27.

Santa Maria Oil Fields, Inc.

Well No. B-1, abandon. P 3-15.

Proposal to abandon approved.

T. 10 N., R. 33 W., S.B.B. & M.

SECTION 35.

Fugler Ranch Oil Company.

Well No. 1, abandon. P 3-9.

Proposal to pull pipe and abandon well, approved, subject to recommendations outlined in the report.

Well No. 1, abandon. P 3-103.

Supplementary proposal relative to removal of casing and placing of cement plugs, approved.

Well No. 1, abandon. P 3-157.

Work of abandonment of this well completed by M. A. Kerr, in accordance with the requirements of this department.

SHAW RANCH.

Standard Oil Co.

Well No. 1, shut off. T 3-84.

Shut-off satisfactory.

T. 9 N., R. 33 W., S.B.B & M.

LAS FLORES LAND AND OIL CO.

Union Oil Co.

Well No. 1, abandon. P 3-179.

Proposal to abandon approved.

Well No. 2, abandon. P 3-66.

Proposal to abandon approved.

BELL RANCH.

Pan-American Petroleum Investment Corporation.

Well No. 1, deepen. P 3-49.

Proposal to deepen approved, with the proviso that the well be drilled to a depth not greater than 3150′.

Well No. 4, shut off. T 3-41.

Shut-off approved.

Well No. 6-A, cement casing. P 3-62.

Proposal to cement string of 8⅝″ casing at 2695′, in order to shut off water entering at depth of 2618′, approved.

Well No. 8-A "Temporary," shut off. T 3-13.

Shut-off approved.

Well No. 13-A "Temporary," shut off. T 3-11.

Shut-off approved. Recommended that in future in drilling out preparatory to shut-off test, wells be drilled to a depth not to exceed 10′ below shoe, preferable 5′, where data as to length of casing and sand line measurements check, in order to avoid complications in making the test.

Well No. 14-A "Temporary," shut off. T 3-24.

Shut-off approved.

Pan-American Petroleum Investment Corporation—Continued.

Well No. 14-A "Temporary," shut off. T 3-53.

Shut-off not successful. Water apparently coming in either from leak in casing or below bridge. Well passed for productivity test.

Well No. 14-A "Temporary," cement casing. P 3-63.

Proposal to cement 8¼" casing at 3490′, in order to shut off water logged at 3094′ and 3278′, approved.

Well No. 14-A "Temporary," cement and deepen. P 3-135.

Proposal to cement 8¼" casing at 3490′ in order to test formations below that depth, approved.

Well No. 14-A "Temporary," shut off. T 3-121.

Shut-off satisfactory.

Well No. 15-A "Temporary," cement and deepen. P 3-136.

Proposal to cement 6¼" 26-lb. casing at depth of 3600′ in order to test formations below for oil, approved, with the understanding that every effort be made to seal the strata between depths of 3600′ and 2744′, in order to prevent migration of fluid from oil and water showings logged at that depth.

Well No. 15-A "Temporary," shut off. T 3-107.

Shut-of satisfactory.

Los Alamos Ro.

Union Oil Company of California.

Well No. 8, Bell, shut off. T 3-14.

Shut-off satisfactory.

Well No. 9, Bell, shut off. T 3-39.

Shut-off approved.

LOS ALAMOS FIELD.

T. 7 N., R. 31 W., S.B.B. & M.

Section 1.

Standard Oil Co.

Well No. 1, Laguna, shut off. T 3-5.

Shut-off satisfactory.

Well No. 1, Laguna, abandon. P 3-53.

Proposal to abandon approved.

Well No. 1, Laguna, abandon, supplementary. P 3-143.

Supplementary proposal to abandon approved.

T. 8 N., R. 31 W., S.B.B. & M.

La Laguna Rancho.

Standard Oil Co.

Well No. 1, Fithian, shut off. T 3-33.

Shut-off satisfactory.

Well No. 1, Fithian, abandon. P 3-152.

Proposal to abandon approved.

T. 8 N., R. 32 W., S.B.B. & M.

Pezzoni Ranch.

Associated Oil Co.

Well No. 1, Pezzoni, shut off. T 3-76.

Test for water shut-off satisfactory.

Corral de Quati.

Associated Oil Co.

Well No. 1, shut off. T 3-88.

Shut-off satisfactory.

T. 9 N., R. 32 W., S.B.B. & M.

Laguna Rancho.

Union Oil Company of California.

Well No. T-2, abandon. P 3-12.

Proposal to abandon approved.

Well No. W-1, abandon. P 3-11.

Proposal to abandon approved.

Well No. W-1, abandon, supplementary. P 3-47.

Supplementary proposal to abandon approved.

LOMPOC FIELD.

T. 6 N., R. 31 W., S.B.B. & M.

Section 16.

Interstate Oil Co.

Well No. 3, redrill. P 3-32.

Proposal to redrill approved. This well was formerly the property of the Santa Barbara Oil Co., Ltd.

Well No. 3, redrill, supplementary. P 3-112.

Proposal to drill out bridge and make pumping test to determine source of water and productivity of formations below depth of 3380′, approved.

Well No. 3, abandon. P 3-129.

Proposal to abandon approved, with the following recommendations: Bridge hole at 3450′ and fill solidly with neat cement to a depth of 3365′, being 15′ above the shoe of the 4½″ casing at 3380′; after bridge has set, shoot and pull 4½″ casing; also remove 6⅝″, 8¼″ and 10″ casings.

Well No. 3, abandon. P 3-130.

Proposal to bridge at 3396′ and put in plug from 3396′ to 3355′, in 4½″ casing, approved.

Well No. 3, abandon. P 3-155.

Proposal to alter position of plug from 1232′ to 1195′, in view of the determined position of the 12½″ shoe, approved.

Well No. 3, shut off. T 3-109.

Shut-off satisfactory, and well passed for further process of abandonment.

T. 7 N., R. 33 W., S.B.B. & M.

Section 9.

Lompoc Oil Developing Co.

Well No. 1, redrill. P 3-68.

Proposal to pull 4½″ casing and cement another string of 4½″ in order to test for production, approved.

Well No. 1, alter casing and plug in. P 3-102.

Proposal to plug hole at bottom and between 2398′ and 2003′, and cement 5⅝″ at 1840′ to test out sand, approved.

Well No. 2, abandon. P 3-28.

Approval of proposal to abandon withheld, pending receipt of further information in regard to the condition of the well.

Well No. 2, abandon. P 3-31.

In view of additional information received in regard to the condition of the well, permission given to remove 3″ casing.

Well No. 2, abandon. P 3-33.

Recommended that all available casing be removed and that a cement plug be placed in the well, to be determined by the work of removing the casing, at about 1000′, to exclude possible surface waters.

Well No. 2, abandon. P 3-83.

Work of abandonment, based on information filed with the department, approved.

ARROYO GRANDE FIELD.

T. 31 S., R. 13 E., M.D.B. & M.

SECTION 31.

California Oil Co.

Well No. 2, McNee, redrill. P 3-13.

Proposal to redrill approved.

Well No. 2, McNee, shut off. T 3-34.

Shut-off satisfactory.

Well No. 3, McNee, redrill. P 3-131.

Proposal to redrill approved.

Well No. 3, McNee, redrill, supplementary. P 3-170.

Supplementary proposal to cement a string of 8¼″ casing inside of 10″ casing, in order to make production test. approved.

Well No. 6, Ltd., Shut off. T 3-77.

Shut-off satisfactory.

Tiber Pacific Oil Co.

Well No. 6, redrill. P 3-29.

Proposal to redrill approved.

Well No. 6, deepen. P 3-118.

Proposal to prospect ahead approved, with the understanding that water conditions be watched.

Well No. 7, shut off. T 3-45.

Shut-off satisfactory.

Well No. 8, shut off. T 3-89.

Shut-off satisfactory.

Well No. 9, drill. P 3-84.

Proposed depth of shut-off approved.

Well No. 9, shut off. T 3-92.

Shut-off satisfactory.

Well No. 10, drill. P 3-133.

Proposed casing program approved.

Well No. 10, drill, supplementary. P 3-203.

Supplementary proposal to drill to productive zone before making a shut-off by cementing the oil string, approved.

SECTION 36.

Louis Titus Oil Co.

Well No. 1, shut off. T 3-8.

Shut-off approved upon statement of superintendent.

T. 32 S., R. 13 E., M.D.B. & M.

SECTION 6.

Louis Titus Oil Co.

Well No. 1, McNee, abandon. P 3-88.

Proposal to abandon account of poor showing of oil and crooked hole, approved.

Well No. 1, McNee, abandon, supplementary. P 3-90.

Supplementary proposal to abandon rejected for the reason that it did not provide for effectively excluding water from coming into the hole from a depth of 1862′ The following recommendations made:

(1) That the well be cleaned out to a depth of 1320′ and plugged with cement from 1320′ to 1250′.

(2) That we be notified upon completion of this plugging operation so that depth to plug can be measured.

(3) That the well be bridged, and plugged with cement between depths of 832′ and 792′.

(4) That this department be notified for test to depth recommended of cement plug inside of the 12½″ casing at a depth of 792′.

Louis Titus Oil Co.—Continued.

Well No. 1, McNee, shut off. T 3-67.

Test was made to determine the depth suitable to cement plug that was started in the shoe of the water string and extended upward to a point above the same. It was concluded that the top plug required by P 3-88 and P 3-90 had been successfully placed, and the well was passed for the final work of abandonment.

Section 18.

Highway Oil Co.

Well No. 1, cement casing. P 3-72.

Proposal to cement string of 6¼″ at 2465′, in order to test for production below this depth, approved.

Well No. 1, shut off. T 3-60.

Shut-off satisfactory.

Well No. 1, abandon. P 3-181.

Proposal to abandon approved. Notice to abandon was later canceled.

MISCELLANEOUS.

Moody Gulch.

T. 9 S., R. 1 W., M.D.B. & M.

Section 8.

Rhoads & Schmitt.

Well No. 1, drill. P 3-151.

Proposal to drill approved.

Livermore Field.

T. 3 S., R. 3 E., M.D.B. & M.

Section 15.

W. M. & S. Oil Co.

Well No. 1, abandon. P 3-178.

Proposal to abandon approved, with the understanding that a signed log of the well is forthcoming.

Well No. 1, abandon, supplementary. P 3-182.

Proposal to remove 11⅝″ casing approved.

BRADLEY FIELD.

T. 24 S., R. 10 E., M.D.B. & M.

Section 35.

Metropolis Oil Co.

Well No. 1, abandon. P 3-141.

Wrecking company enjoined from doing proposed work by owners of land.

Section 36.

Associated Oil Co.

Well No. 1, King, deepen. P 3-24.

Proposal to drill ahead with 8¼″ casing in prospect for oil, approved.

Well No. 1, King, abandon. P 3-54.

Proposal to abandon approved.

R. K. Howk.

Well No. 1, Pleyto Cons. Oil Co., abandon. P 3-38.

Proposal to abandon approved, under conditions outlined.

Well No. 1, Pleyto Cons. Oil Co., abandon. P 3-82.

Abandonment operations approved.

SARGENT FIELD.

T. 11 S., R. 4 E., M.D.B. & M.

SECTION 31.

Watsonville Oil Co.

Well No. 6, redrill. P 3-187.

Proposal to plug well in formations with cement between the depths of 1757′ and 1800′, approved.

Well No. 7, abandon. P 3-172.

Supplementary proposal to abandon approved.

Well No. 7, abandon. P 3-188.

Report of abandonment operations approved.

Well No. 9, abandon. P 3-8.

Proposal to abandon approved.

Well No. 10, abandon. P 3-1.

Proposal to abandon approved.

Well No. 12, abandon. P 3-34.

Proposal to abandon approved.

Well No. 13, drill.

Proposed depth of water shut-off approved.

Well No. 13, shut off. T 3-126.

Shut-off satisfactory.

PARKFIELD DISTRICT.

T. 23 N., R. 14 W., S.B.B. & M.

SECTION 15.

Southern Pacific Co.

Well No. 1, drill. P 3-139.

Proposed depth of water shut-off approved.

HUASNA FIELD.

T. 11 N., R. 32 W., S.B.B. & M.

NIPOMO RANCH.

Associated Oil Co.

Well No. 1, Stow, shut off. T 3-108.

Shut-off not satisfactory. Approval withheld awaiting further test. Casing cemented in serpentine.

Well No. 1, Stow, deepen. P 3-166.

Proposal to deepen without further water shut-off approved.

Well No. 1, Stow, abandon. P 3-180.

Proposal to abandon approved.

T. 12 N., R. 33 W., S.B.B. & M.

SECTION 25.

Todd-Peck Syndicate.

Well No. 1, Clarion Oil Co., deepen. P 3-27.

Proposal to deepen approved.

Well No. 1, Clarion Oil Co., abandon. P 3-164.

Proposal to abandon approved.

SANTA MARIA FIELD.

T. 9 N., R. 33 W., S.B.B. & M.

SECTION 19.

New Pennsylvania Petroleum Company.

Well No. 4, alter casing. P 3-64.

Proposal to remove 4½″ casing approved.

New Pennsylvania Petroleum Co.—Continued.

Well No. 4, alter casing. P 3-98.

Proposal to cut and remove 6¼″ casing and perforate 8¼″ casing, approved, with the understanding that water conditions be properly taken care of.

Rice Ranch Oil Co.

Well No. 14, drill, supplementary. P 3-14.

Witnessed bailing test proving that there was no water back of the 10″ casing to depth of cementing, 2460′.

Section 22.

Union Oil Co. of California.

Well No. 3, Los Flores, deepen. P 3-50.

Recommendation withheld pending test of shut-off of 8¼″ casing.

Well No. 3, Los Flores, deepen. P 3-80.

Recommendation withheld pending further information as to source of water present under 8¼″ casing.

Well No. 3, Los Flores, deepen. P 3-86.

Proposal to deepen approved.

T. 9 N., R. 34 W., S.B.B. & M.

Section 22.

Union Oil Co. of California.

Well No. 4, Hartnell, abandon. P 3-35.

Proposal to abandon approved.

Section 23.

Radium Oil Co.

Well No. 1, abandon. P 3-221.

Proposal to abandon approved, with recommendation that 40′ cement plug be placed one-half in formations and one-half in 12½″ casing, between depths of 675′ and 635′.

Section 26.

Union Oil Co. of California.

Well No. 8, Squires, deepen. P 3-77.

Proposal to deepen approved.

Well No. 8, Squires, deepen. P 3-89.

Proposal to make pumping test to determine condition of 6¼″ shut-off, approved.

Well No. 8, Squires, shut off. T 3-65.

Shut-off satisfactory.

Well No. 14, Squires, deepen. P 3-158.

Proposal to deepen approved, with the understanding that a string of casing will be cemented just above the top of the third oil zone, and that sufficient cement will be forced behind this casing to effectively seal the formations of the second oil zone, up to a depth of 3070′.

Well No. 4, California Coast, shut off. T 3-4.

Shut-off satisfactory.

Well No. 7, California Coast, deepen. P 3-40.

Proposal to deepen approved, with the understanding that a sufficient quantity of cement be placed back of the 6¼″ casing to seal the oil bodies of the second zone so as to protect them from infiltrating water.

Well No. 8, California Coast, deepen. P 3-184.

Proposal to deepen approved.

Los Alamos Ro.

Union Oil Co. of California.

Well No. 1, Graciosa, deepen. P 3-96.

Proposal to waive bailing test and subject the well to pumping test, approved.

Well No. 1, Graciosa, shut off. T 3-66.

Shut-off, determined by pumping test, approved.

Well No. 5, Graciosa, shut off. T 3-20.

Shut-off satisfactory.

Union Oil Co.—Continued.

Well No. 6, Graciosa, deepen. P 3-39.

Proposal to deepen approved, with the recommendation that a sufficient quantity of cement be placed back of the 6¼″ casing to seal the oil bodies of the second zone so as to protect them from infiltrating water.

Well No. 6, Graciosa, shut off. T 3-96.

Shut-off satisfactory.

Well No. 7, Graciosa, deepen. P 3-199.

Proposal to deepen approved, with the recommendation that care be taken to determine the character of formations encountered and to obviate the possibility of cementing above water-bearing strata, as in the vicinity of Harris No. 3.

Well No. 8, Graciosa, shut off. T 3-21.

Shut-off not successful. Recommended one of following procedures:

(1) Put in a string of 4½″ and cement at a depth below the present 6¼″ landing at 3296′, or

(2) Redrill and cement a string of 6¼″ below present depth of 6¼″, landing at 3296′.

Well No. 15, Graciosa, deepen. P 3-26.

Proposal to cement a string of 6¼″ casing at 3800′, approved, with the understanding that sufficient cement be used to thoroughly seal all second zone formations from a depth of 2682′ (landing point of 8¼″ casing) to the bottom of 6¼″ casing.

Well No. 1, Harris, deepen. P 3-21.

Proposal to deepen approved.

Well No. 2, Harris, deepen. P 3-20.

Proposal to deepen approved.

Well No. 3, Harris, shut off. T 3-22.

Shut-off approved.

Well No. 3, Harris, shut off. T 3-90.

Most of the cement, used for shut-off, was left inside the casing. Well passed for pumping test.

Well No. 3, Harris, drill, supplementary. P 3-138.

Pumping test, as recommended in Report T 3-90, showed that the well produced 10 barrels of oil and 10 barrels of water per day. The company proposed to put in a string of 6¼″ casing, and cement at the top of the third oil zone. Proposal to cement string of 6¼″ casing was approved with the recommendation that the shut-off be made at a depth of about 3750′. The company stated that they believed that the recommended depth of shut-off was too deep. The company's attention was called to the fact that average distance from the top of the second oil zone to the top of the third oil zone is 550′ to 600′ in this locality. It was noted that in deepening to the third zone the usual procedure, with some exceptions to be mentioned hereafter, has been to cement a string of casing at the top of the third oil zone. It was also noted that in Harris Well No. 3, the 8¼″ casing was cemented at 3457′, or 247′ below the top of the second oil zone.

It was pointed out that in wells Nos. 6 and 17, Newlove, and No. 14 Graciosa, shut-offs, for the purpose of excluding second zone oil and water, had been made at depths considerably shallower than the shut-offs in most of the wells of the group. Study of the production data of the sixteen third zone wells of the group, showed that the three wells mentioned were wet wells. It was noted that in each of the three wells mentioned, a shut-off was made because of the good oil showing in sand supposedly at the top of the third oil zone proper. There were sufficient data to show that the sand thus included in the third zone production of Newlove wells Nos. 6 and 17 and Graciosa Well No. 14, does not correlate with the producing sand in most of the third zone wells of the group. The top of said sand lies about 200′ above the top of the third oil zone proper. It was, therefore, concluded that water appearing in third zone wells of the group, was coming from one of the following sources:

(1) Shut-offs not successful in Newlove 6, 17 and Graciosa 14. Newlove 6 showed successful shut-off in pumping test (see Report B-84, April 19, 1917). The

other wells showed successful tests for shut-off and this source was thought to be least probable.

(2) That the intermediate or "stray" oil sand, between the second and third oil zones, above which shut-offs are made in the three wet wells, carries water.

(3) That the third zone sand in these wells, being the farthest down the dip, carries edge-water.

This department therefore suggested that the company drill to a depth not greater stratigraphically than that at which the intermediate or stray sand is found in wells Nos. 6 and 17 Newlove (3600′ to 3650′), or to such depth, above 3650′, at which formations would stand up, and put the well on the pump at that depth. It was also stated that if such production test, provided the well were deep enough to engage the stray sand, showed the well to be making no more water, that is, 10 barrels per day, than it did immediately below the 8¼″ shut-off, this department would consider it unnecessary to cement another string of casing, providing the hole was finished in such condition, as to liner and other mechanical operations, that another string could be cemented in case the well later developed water, and test showed such a course to be necessary.

Well No. 3, Harris, drill, supplementary. P 3-144.

Company proposed to continue drilling to a probable depth of 3650′, or as near that as conditions as a whole would permit, and make another pumping test and report results. The proposal was approved.

Well No. 3, Harris, drill, supplementary, by letter. P 3-154.

On March 28th the following letter was received from Mr. E. C. Critchlow, division superintendent of the Union Oil Co.:

"Referring to our conversation in your office yesterday relative to condition of our Harris No. 3, and confirming what we agreed upon at that time have to say that the well with a pumping test covering one week showed a production of approximately 200 barrels per day with a water content of from 40 to 50 per cent. As this well was only drilled into what you term a 'stray sand' we propose now to continue drilling operations until we pass through this sand, and then put the well to producing with the idea of knowing definitely how much oil and its character this sand contains. If, after sufficient test, it is not deemed advisable to produce from this sand we will bridge at the top of it and again, by a pumping test, find out if we still have the same amount of water and oil between the bridge and the bottom of our 8¼″ pipe. We will then be in a position to definitely determine whether this sand should be produced from or whether we should put a string of 6¼″ through it and cement it off."

The operations proposed in the letter were approved as follows:

(1) Continue drilling until the hole passes through sand entered at about 3630′.

(2) After passing through sand put the well on pump and test for productivity as to oil and water.

(3) Report results of such test to this department.

(4) After the results of above mentioned test are at hand, further recommendations, covering the program of testing in this well, as outlined in the above quoted proposal, will be made.

On May 8, 1918, a representative of this department visited the well, and found that it was drilled to a total depth of 3731′. The company at that time was bridging back above the sand entered at a depth of 3630′, in order to determine whether or not there had been an increase of water above the 10 barrels per day originally produced just below the 8¼″ shut-off. On June 25, 1918, Mr. Critchlow, division superintendent, stated to Deputy Supervisor Bell that after making exhaustive pumping tests, he was satisfied that the so-called "stray sand" contained water, and they would have to cement off below it.

Western Union Oil Co.

Well No. 47, redrill and plug. P 3-36.

Proposal to plug bottom of well into 6¼″ casing with cement, cut 6¼″ casing, and try well for production, approved.

Western Union Oil Co.—Continued.

Well No. 52, deepen. P 3-42.

Proposal to deepen approved.

Well No. 58, drill, supplementary. P 3-44.

Proposal approved.

Well No. 58, deepen. P 3-100.

Proposal to prospect for production, with the plan of shutting off water at 4400′ to 4450′, with a string of 6¼″ casing, should production be found, approved.

Well No. 62, shut off. T 3-36.

Shut-off satisfactory.

Well No. 62, shut off. T 3-74.

Shut-off satisfactory.

Well No. 63, drill. P 3-160.

Proposal to drill approved.

Well No. 63, shut off. T 3-112.

Shut-off satisfactory.

Well No. 64, drill. P 3-156.

Proposed depth of cementing casing, approved.

Well No. 64, shut off. T 3-118.

Shut-off satisfactory.

Well No. 65, drill. P 3-183.

Proposal to drill approved, with the exception of the depth for cementing 10″ casing, approval of which is withheld, awaiting log of proposed well.

Well No. 65, shut off. T 3-128.

Shut-off satisfactory.

Well No. 66, drill. P 3-191.

Proposal to drill approved, with the exception of the depth for cementing 10″ casing, approval of which is withheld awaiting log of proposed well.

NEWLOVE LEASE.

Union Oil Co. of California.

Well No. 9, Newlove, deepen. P 3-3.

Proposal to deepen approved, with the recommendation that a string of 6¼″ casing be landed and cemented at a depth of 3360′, using sufficient cement to seal to second zone formations between depths of 2795′ and 3360′.

Well No. 11, Newlove, deepen. P 3-2.

Proposal to deepen approved, with the recommendation that a string of 6¼″ casing be landed and cemented at a depth of about 3185′, using sufficient cement to seal all second zone formations between depths of 2679′ and 3185′.

Well No. 11, Newlove, shut off. T 3-43.

Shut-off satisfactory.

Well No. 33, Newlove, shut off. T 3-23.

Shut-off satisfactory.

Well No. 45, Newlove, shut off. P 3-51.

Shut-off satisfactory.

Well No. 46, Newlove, drill. P 3-161.

Proposal to drill approved, with the understanding that a formation shut-off is to be made with 12½″ casing in order to protect from top waters shallower than 500′, as in Western Union No. 61, at 215′, Western Union No. 62, at 95′, and Western Union No. 60 at 270′, and that careful tests be made while drilling to determine the presence or absence of such top waters, the results of which would indicate the advisability of cementing the 10″ string.

CASMALIA FIELD.

T. 9 N., R. 34 W., S.B.B. & M.

PUNTA DE LA LAGUNA RO.

Associated Oil Co.

Well No. 34, Arellanes, drill. P 3-122.

Proposed depths of shut-off approved.

Well No. 42, Arellanes, drill.

Proposed depths of cementing 12½″ and 10″ casings approved. Proposal to land 8¼″ at 1900′ rejected until company show reasonableness of drilling to such depth in face of water conditions in adjoining wells.

Well No. 42, Arellanes, shut off. T 3-116.

Test of shut-off satisfactory.

Well No. 52, Arellanes, drill.

Proposed depths of cementing 12½″ and 10″ casings approved. Proposal to land 8¼″ casing at 1850′ rejected until company show reasonableness of drilling to such depth in face of water conditions in adjoining wells.

Well No. 52, Arellanes, shut off. T 3-85.

Tests Nos. 1 and 2 showed fluid entering hole. 12½″ was cemented at 920′. Following several tests for water shut-off 100 sacks of cement were run in outside of casing through 620′ of 1″ pipe. Subsequent test for water shut-off satisfactory.

Well No. 52, Arelianes, shut off. T 3-98.

Test of shut-off satisfactory.

Well No. 53, Arellanes, drill. P 3-123.

Proposed casing program approved.

Well No. 61, Arellanes, shut off. T 3-29.

Test of shut-off satisfactory.

Well No. 61, Arellanes, pumping test. P 3-108.

Proposal to make pumping test approved.

Well No. 61, Arellanes, shut off. T 3-79.

Pumping test satisfactory.

Well No. 62, Arellanes, drill.

Proposed depths of cementing 12½″ and 10″ casings approved. The proposal to land 8¼″ at 1850′ rejected as the well would probably enter bottom water.

Well No. 62, Arellanes, shut off. T 3-52.

Test of shut-off satisfactory.

Well No. 62. Arellanes shut off. T 3-91.

Test of shut-off satisfactory.

Well No. 62, Arellanes, plug. P 3-176.

Proposal to plug well in bottom to eliminate water approved.

Well No. 63, Arellanes, drill. P 3-124.

Proposed casing program approved.

Well No. 71, Arellanes, mud. P 3-149.

Proposal to pump mud from surface outside of 12½″ casing to depth of approximately 500′, in an effort to shut out possible surface water, approved.

Well No. 72, Arellanes, drill.

Proposed depth of cementing 12½″ and 10″ casings approved. Proposal to land 8¼″ casing at 1825′ rejected account of possibility of entering hot water stratum before reaching this depth.

Well No. 72, Arellanes, shut off. T 3-46.

Test of water shut-off satisfactory.

Well No. 72, Arelianes, shut off. T 3-61.

Test of water shut-off satisfactory.

Well No. 80, Arellanes, plug. P 3-59.

Proposal to plug in bottom, to eliminate production of hot water approved.

Well No. 80, Arellanes, plug. P 3-150.

Proposal to place additional plug to eliminate water approved.

Associated Oil Co.—Continued.

Well No. 81, Arellanes, shut off. T 3-1.

Test of water shut-off satisfactory.

Well No. 82, Arellanes, drill.

Proposed depth of cementing 12½″ and 10″ casings approved. Proposal to land 8¼″ casing at 1800′ rejected account possibility of entering hot water stratum near that depth.

Well No. 82, Arellanes, shut off. T 3-64.

Test of water shut-off satisfactory.

Well No. 82, Arellanes, shut off. T 3-86.

Test of water shut-off satisfactory.

Well No. 91, Arellanes, plug. P 3-148.

Proposal to plug from 1720′ to 1660′ to exclude hot water production approved.

Well No. 92, Arellanes, drill.

Proposed depth of cementing 12½″ and 10″ casings approved. Proposal to land 8¼″ casing at 1800′ rejected account possibility of entering hot water stratum before reaching this depth.

Well No. 101, Arellanes, shut off. T 3-71.

Test for water shut-off satisfactory.

Well No. 101, Arellanes, shut off. T 3-110.

Test for water shut-off satisfactory.

Doheny Pacific Petroleum Co.

Well No. 1, Soladino, plug. P 3-107.

Hole was bridged from 1555′ to 1419′ and water production decreased from 481 bbls. per day before bridging to 50 bbls. per day after bridging. In view of above performance of the well, which indicated water in formations somewhere below 1419′, the proposal to plug bottom of hole with cement to a depth of 1750′ was approved.

Well No. 1, Soladino, plug. P 3-145.

After plugging operation approved in report No. P 3-107 the well still showed considerable water and proposal to place additional plug to a depth of 1700′ was approved.

Well No. 3, Soladino, plug. P 3-37.

Proposal to plug from 1862′ to 1650′ to exclude bottom water approved.

Well No. 3, Soladino, pumping test. P 3-75.

Although results of pumping test, subsequent to plugging approved in report P 3-75 indicated a considerable decrease in water produced, as compared with production prior to plugging, approval of plugging operations was withheld awaiting the results of plugging operations in adjacent and neighboring wells.

Well No. 4, Soladino, plug. P 3-17.

Proposal to plug from 1850′ to 1650′ to exclude bottom water approved.

Well No. 4, Soladino, pumping test. P 3-76.

A comparison of data on pumping tests made before and after plugging as per report No. P 3-37 shows that prior to plugging the well averaged 65 bbls. oil and 295 bbls. water per day for a period of 15 days. After plugging, the well averaged 265 bbls. oil and 125 bbls. water per day.

It was concluded from the foregoing that plugging in bottom had materially improved the condition of the well. However, approval of plugging operations was withheld awaiting results of plugging in adjacent and neighboring wells and further results of pumping Soladino No. 4.

Well No. 5, Soladino, pumping test. P 3-78.

During the first fifteen days of pumping the production increased in emulsion and finally changed into flowing hot water. It was concluded that water was coming into the well from formations below the 10″ shut-off.

Considering the fact that Soladino wells No. 3 and No. 4 were each plugged in bottom to a depth of 1650′ and that Soladino No. 2 produced 420 bbls. oil and 25 bbls. water per day from a total drilled depth of 1565′, stratigraphically much less than any other Soladino wells, it was recommended that Soladino No. 5 be plugged in bottom to a depth of 1670′ and subjected to further production tests.

Well No. 5, Soladino, plug. P 3-146.

Proposal to plug, in accordance with recommendation in report No. P 3-78, approved.

Well No. 7, Soladino, pumping test. P 3-79.

On account of intermittent production large quantities of water recommended plug to 1700′.

Well No. 7, Soladino, plug. P 3-137.

Study of cross sections prepared by A. D. Fyfe, geologist for the company, showed that No. 7 was not as deep stratigraphically as first information led us to suppose. Recommendations of Report No. P 3-79, as to plugging, therefore canceled.

Well No. 8, Soladino, shut off. T 3-25.

12½″ 40-lb., originally cemented at 1803′, collaped at 1440′ upon bailing. Another string was cemented at 1100′. Tests for water shut-off not conclusive. Recommended drilling ahead below 1440′, original point of collapse, and test further for water.

Well No. 8, Soladino, pumping test. P 3-81.

Proposal to make pumping test was filed at the request of the deputy so that the company's daily reports for production of oil and water could be written into the records. Recommendations as to pumping test are covered in report T 3-59.

Well No. 8, Soladino, shut off. T 3-59.

Pumping test for water shut-off satisfactory. Recommended second shut-off at 1600′.

Well No. 8, Soladino, plug and test. P 3-116.

Proposal to bridge hole to 1600′ and test for water approved.

Well No. 9, Soladino, shut off. T 3-16.

Test for water shut-off satisfactory.

Well No. 9, Soladino, redrill. P 3-153.

Proposal to make dye test to determine source of water approved. Recommended that, in redrilling, a string of 12½″ casing be cemented at 830′ in order to be stratigraphically uniform with shut-off in Soladino No. 6.

Well No. 10, Soladino, shut off. T 3-27.

Test for water shut-off satisfactory.

Well No. 10, Soladino, deepen. P 3-41.

Proposal to deepen approved with proviso that well is not to be drilled to a depth greater than 1750′.

Well No. 11, Soladino, shut off. T 3-40.

Test for water shut-off satisfactory.

Well No. 12, Soladino, shut off. T 3-94.

Test for shut-off inconclusive. Recommended drilling ahead to first definite oil showing and making pumping test to determine whether there was an increase in small amount of water showing in test.

Well No. 14, Soladino, cement. P 3-101.

Proposal stated that well was making small amount of water. Proposed to cement another string of casing just above oil encountered at 1142′.

After reviewing data it was concluded that the cementing of another string of casing for the exclusion of 3 bbl. of water per day would hardly seem necessary. Therefore, recommended that the well be bailed dry and allowed to stand for 24 hours in order to determine exact rate of entry of water into the hole.

Well No. 14, Soladino, cement. P 3-106.

Acting upon our recommendation in report No. P 3-106 (see above) hole was bridged at 1120′. Hole was bailed dry and after standing 72 hours bailer was run and showed 316′ of water in the hole. Proposal to cement 10″ casing was approved.

Doheny-Pacific Petroleum Co.—Continued.

Well No. 14, Soladino, shut off. T 3-87.

Test for water shut-off 10″ casing approved. See reports P 3-101 and P 3-106 above.

Well No. 14, Soladino, drill, supplementary. P 3-167.

Proposal to mud formations and recement either the 12½″ casing or 10″ casing in this well was approved because of the following conditions reported by Mr. T. A. Collins, superintendent:

> "After drilling this well into production to a total drilled depth of 1800′, we put well on pump for production test. We found very little oil and one bailer of water every six hours. Placed plug 20′ under 10″ pipe and found water had broken in around shoe of 10″ casing. We put a strain on 10″ casing and with little trouble pulled it loose. When 10″ casing came loose the well showed increase of three bailers of water per hour."

The 10″ casing was originally cemented with 100 sacks cement by the Perkins process and, because of the ease with which the casing was later removed, as reported by Mr. Collins, it is concluded that the cement fluid was pumped into the fractured shale formations immediately adjacent to the shoe of the 10″ casing.

The company's proposal to mud the hole, prior to cementing, was made with the idea of sealing these fractured shale formations so that the cement fluid column could later be confined to the space between the wall of the hole and the casing.

Well No. 14, Soladino, shut off. T 3-124.

This test was witnessed for the purpose of determining probable efficiency of mudding operations proposed and covered in preceding report No. P 3-167.

It was reported that about 170 cu. yds. of mud fluid had been forced into the formations adjacent to the 12½″ and 10″ shoes, that is between depths of 1025′ and 1120′, under a closed pressure of about 600 lbs. maximum and during a period of about 20 days. Manure was also used to assist in clogging the porous strata. At the time of inspection heavy mud fluid was being pumped down the 10″ casing and returned to the surface between the 10″ and 12½″ casings. The open pressure developed was 200 lbs.

It was concluded that the mudding had been done in an efficient and workmanlike manner and that the desired end, the building of an impervious deposit around the hole had probably been accomplished.

Well No. 36, Soladino, drill. P 3-104.

Proposed casing program approved.

Well No. 36, Soladino, shut off. T 3-72.

Test for water shut-off satisfactory.

Well No. 37, Soladino, drill. P 3-105.

Proposed casing program approved.

Well No. 37, Soladino, shut off. T 3-75.

Test for water shut-off satisfactory.

Well No. 38, Soladino, shut off. T 3-63.

Test for water shut-off satisfactory.

Well No. 39, Soladino, shut off. T 3-7.

Test for water shut-off satisfactory.

Well No. 40, Soladino, shut off. T 3-57.

Pumping test for water shut off satisfactory.

Well No. 41, Soladino, shut off. T 3-15.

Test for water shut-off satisfactory.

Well No. 41, Soladino, redrill. P 3-193.

Company proposed to mud formations between depths of 1142′ and 1674′ in order to protect said formations from surface water and, further, in order to temporarily exclude water from formations below 1674′ so that a pumping test could be made of formations below said depth to determine content of lower formations as to oil and water. The final depth of mudding and cementing was dependent upon the results of the foregoing operations. Proposal was approved.

Doheny-Pacific Petroleum Co.—Continued.

Well No. 2, Lease 1, shut off. T 3-58.

Pumping test for water shut-off satisfactory.

Well No. 2, Lease 1, bridge. P 3-127.

Proposal to bridge under 10″ casing, to determine source of water, approved.

Well No. 6, Lease 1, shut off. T 3-6.

Test for water shut-off satisfactory.

Well No. 6, Lease 1, redrill. P 3-192.

Company proposed to mud formations between depths of 1121′ and 1250′ and hold the mud and water temporarily above 1250′ with the 10″ casing, for the purpose of making a pumping test, and to either cement the 10″ casing at 1250′ or make a further test of the same nature to determine the source of the water and final depth of mudding and cementing. Proposed operations approved.

Well No. 7, Lease 1, plug and bridge. P 3-73.

Plugging and bridging operations not conclusive as to source of the water. Recommended that the well be bridged again between depths of 1170′ and 1220′ in order to determine source of water.

Well No. 7, Lease 1, shoot. P 3-110.

Proposal to shoot with 250 lbs. gelatin, to increase production, approved with proviso that shot be placed at a depth greater than 1550′.

Well No. 10, Lease 1, shut off. T 3-3.

Test for water shut-off satisfactory.

Well No. 10, Lease 1, deepen. P 3-16.

Proposal to deepen approved under the following recommendations:

1. That the well be drilled as nearly "dry" as possible.
2. That the hole be drilled to a depth not to exceed 1950′.
3. That should water be encountered in drilling below the present depth of 1775′ and the recommended depth of 1950′ this department be notified immediately.

Well No. 10, Lease 1, supplementary, deepen. P 3-19.

Proposal to suspend deepening operations and test for productivity between the depths of 1830′ and 1850′ and later proceed to originally proposed depth, in event of no production in formations between 1830′ and 1850′, approved.

Well No. 10, Lease 1, plug and test. P 3-45.

Proposal to plug from 1850′ to 1650′ and later bridge under 12½″ casing, if necessary, in order to determine source of water, approved.

Well No. 11, Lease 1, redrill. P 3-74.

Proposal to redrill bottom joint 12½″ casing approved.

Well No. 11, Lease 1, shut off. T 3-69.

Test for water shut-off satisfactory.

Well No. 14, Lease 1, shut off. T 3-9.

Bailing test not conclusive. Well passed for pumping test of water shut-off.

Well No. 14, Lease 1, plug and test. P 3-46.

Well suddenly started producing 700 bbls. fluid per day of which 70% to 90% was water at 140° F. Proposal to plug bottom and also bridge under water string, if necessary, in order to determine source of water, approved.

Well No. 14, Lease 1, pumping test. P 3-69.

Proposal to make pumping test, in order to determine efficacy of plugging operations, approved.

Well No. 14, Lease 1, pumping test. T 3-93.

See report No. P 3-46. At the end of 70 days pumping well produced 135 bbls. fluid per day running 8.4 per cent water.

Well No. 15, Lease 1, shut off. T 3-50.

Test for water shut-off satisfactory.

Well No. 16, Lease 1, shut off. T 3-28.

Test for water shut-off satisfactory.

Well No. 17, Lease 1, shut off. T 3-30.

Test for water shut-off satisfactory.

Doheny-Pacific Petroleum Co.—Continued.

Well No. 17, Lease 1, deepen. P 3-48.

Proposal to deepen to 1450′ approved.

Well No. 27, Lease 1, shut off. T 3-37.

Test for water shut-off satisfactory.

Well No. 27, Lease 1, deepen. P 3-97.

Proposal to deepen to 1960′ approved.

Well No. 27, Lease 1, deepen. P 3-115.

Proposal to deepen to 2015′ approved.

Well No. 27, Lease 1, deepen. P 3-171.

Proposal to deepen Well No. 27 from 2015′ to 2165′ rejected unless work is done in stages and without an appreciable increase in water. Rejection of proposal for further deepening was based on data given below:

Doheny-Pacific Well	Depth	Depth below sea	Physical condition	Stratigraphic depth compared with No. 27, Lease 1	Daily production		Probable source of water
					Barrels oil	Barrels water	
No. 27, Lease 1	2015	1360	------------------	---------------	55	8	Bottom
No. 7, Lease 1	*1830	1301	*Plug 1925 to 1830	Same	18	5	Bottom
No. 4, Lease 1	1398	918	------------------	Shallower	42	26	Top
No. 5, Lease 1	1494	1017	------------------	Shallower	32	28	?
No. 4, Lease 2	1900	1338	------------------	Shallower	44	13	?
No. 5, Lease 2	1710	1175	------------------	Shallower (?)	43	17	Bottom
No. 6, Lease 2	1806	1280	------------------	Shallower (?)	50	25	Bottom

Well No. 27, Lease 1, deepen. P 3-200.

Company proposed to deepen in 50′ stages instead of 20′ stages, as recommended in Report P 3-171. This department ruled as follows:

"From data at hand as per our Report P 3-171, Well No. 27, Lease 1, is stratigraphically as deep or deeper than the neighboring wells. Unless new data can be submitted to change this view or to show that the water now made by this well is either top water or water let into oil zone by some other well, the recommendation, of May 13, 1918, as per Report P 3-171, will be unaltered, except that at your option the well may be bailed dry after each 20′ of deepening and left undisturbed at least 12 hours for bailing test by this department. This bailing test will, if you desire, eliminate the necessity of pumping the well for test."

Well No. 1, Lease 2, shut off. T 3-19.

Test for water shut-off satisfactory.

Well No. 1, Lease 2, land casing. P 3-55.

Company proposed to cement string of 8¼″ casing at 2450′ in order to shut off water at 2307′. Recommended sealing all formations (shale) with cement, between depths of 1910′ and 2450′, in order to protect strata from which Union Oil Company Well No. 2, Escolle, was producing, sealing operations to be witnessed by representative of this department.

Well No. 1, Lease 2, cement. P 3-56.

Complying with recommendations in our report No. P 3-55, see above, sealing operations at this well were witnessed as follows:

"Hole tested for circulation. Got returns of muddy water. Casing set on bottom and tested with pumps to 300 lbs. pressure. Casing lifted 18″.

"Started hydraulic lime at 4:12 p.m. Got fluid return at 3:14 p.m. Pump slowed down at 3:17 p.m. and stopped at 3:18 p.m. Mixture of 60 sacks hydraulic lime delivered. Fluid return at casing head throughout the delivery. Time 6 minutes.

"Set pipe on bottom and put in first plug at 3:20-30 p.m. Fluid return stopped. Pipe delivery line reconnected, and casing lifted off bottom 18″, at 3:22-30 p.m. Time 4½ minutes.

"Delayed here, mixing 8 sacks cement, pumping water into mixing pans, etc. Casing lifted 6″ more. Started pumps 3:30 p.m. Time 7½ minutes.

"Started delivery of mixture of 150 sacks cement 3:30 p.m. Pump down at 3:42 p.m. Started 3:42-45 p.m. Down 3:43 p.m. Time 13⅓ minutes.

"During delivery of cement the returning fluid was at first muddy water, showing traces of oil and gas. Toward end of delivery fluid changed to thin mud, slightly foamy.

"Set casing on bottom, took off elevators, and disconnected delivery line 3:45 p.m. Placed second plug, connected delivery line, put on elevators, and pipe lifted 18″ at 3:48-50 p.m. Time 5⅔ minutes.

"Started water 3:48-50 p.m. Figured 153 bbls. necessary to drive plugs together. Toward end of water delivery fluid returning cleared up to muddy water.

"The following are successive pump pressures from beginning to end of water delivery:

3:48-50 p.m.— 4 lb.
4:23-00 p.m.— 60 lb.
4:26-30 p.m.—120 lb.
4:33-00 p.m.—250 lb.
4:36-00 p.m.—500 lb.

"Plugs together. Delivery 153 bbls. Time 47⅙ minutes. Pump down and casing dropped at 4.36 p.m. Pressure partly released and casing moved 6″ to bottom. At 4:38 p.m. operation completed. Total time for lime and cement, 1 hour and 24 minutes.

"From the manner in which the work was performed, as well as the condition of the hole, shown from behavior of fluid returns at the surface, it is reasonable to conclude that the sealing operation was a success.

"The well was therefore passed for a test for water shut-off."

Well No. 1, Lease 2, bridge. P 3-70.

While drilling out below 8¼″ shut-off for test the hole filled up 2000′ with water. It was suspected that this water was coming from below cementing point. However, company's proposal to bridge just below 8¼″ shoe in order to test for water shut-off was approved as most logical step in determining source of water.

Well No. 1, Lease 2, redrill. P 3-91.

Proposed to make further effort to bridge under the 8¼″ casing. Approved.

Well No. 1, Lease 2, shut off. T 3-70.

In test for water shut-off of 8¼″ casing on bridge proposed in Report P 3-91, the well showed small amount of water. It was concluded that this water was coming through bridge. It was decided to drill out bridge and note whether or not water increased. Bailed dry at 9:00 a.m. January 2d. At 9:00 a.m. January 3d found fluid level at 1700′, showing that water had come in at average rate of 89 gals. per hour.

Started drilling on bridge at 11:00 a.m. January 3d. Drilled to 2492′ and at 12:30 p.m. January 3d, found fluid level at 1235′, showing that 465′ of water had entered the hole during the two hours the plug was intact and the one and one-half hours after drilling started. This represented an average of 370 gals. per hour for the entire period, but the water came in much faster after the drilling was done.

From the above data it was concluded that the water which entered the hole came from formations below the 8¼″ shoe and mostly leaked past the bridge.

Well No. 3, Lease 2, drill. P 3-177.

Proposed to make temporary shut-off with 12½″ casing and prospect ahead before making final shut-off with 10″ casing. Proposal approved.

Well No. 3, Lease 2, shut off. T 3-127.

Temporary formation shut off at 396′ with 12½″ casing to exclude water at 310′, entering the hole at the rate of 50 bbls. per hour, in order to test formations between depths of 396′ and 850′ for water.

A 20″ hole was drilled and about 220 cu. ft. mud was converted to mud fluid and placed behind the 12½″ casing at the surface.

The hole was drilled "dry" below 396′.

Bailing test showed the temporary shut-off to be successful and that formations between depths of 396′ and 850′ were dry.

When the prospecting operations are concluded it is the company's intention to mud and cement string of 10″ casing and then remove the 12½″ casing from the hole.

Well No. 4, Lease 2, shut off. T 3-57.

Test for water shut-off satisfactory.

Well No. 4, Lease 2, deepen. P 3-125.

Proposal to deepen well 75′ approved.

Well No. 6, Lease 2, bridge and test. P 3-128.

Proposal to bridge and test water shut-off approved.

Well No. 6, Lease 2, shut off. T 3-111.

Bailing test showed no water coming in above bridge proposed in Report No. P 3-128.

T. 9 N., R. 34 W., S.B.B. & M.

SECTION 5.

Eagle Creek Syndicate.

Well No. 1, Dargie, drill. Report P 3-67.

Casing program approved.

SECTION 19.

Associated Oil Co.

Well No. 21, Peshine, deepen. P 3-6.

Proposal to deepen, drilling "dry," approved.

Well No. 31, Peshine, shut off. T 3-10.

Bailing tests showed the 12½″ hole to be filling at the rate of about 1′ per hour.

Deputy recommended running casing tester, as there was some old pipe in the hole. Casing tester was placed at bottom at 8:30 a.m. August 2, 1917. Tester was pulled at 11:30 a.m. August 2d and came up dry.

One pound of aniline (red) dye was put into the hole outside the 12½″ casing at this time and the deputy recommended that the hole be drilled ahead (dry) 50′ with the idea that if the water appearing in the hole were native to formations between the 12½″ shut-off the flow would increase as the drill entered further into the shales, or that if there were a small leak around the shoe the dye would appear in the hole. The hole was drilled ahead 50′ and bailed to bottom at 9:00 a.m. August 3, 1917. At 7:00 p.m. August 3, 1917, bailer was measured to new bottom at 1085′ and came up empty. Bailer was run again and brought up about two gallons of water and a showing of tar.

It was concluded from the foregoing that the water appearing at the initial test was drilling water which, in drilling the 50′ of new hole, was completely recovered from the shales in which it had been absorbed.

Well No. 41, Peshine, shut off. T 3-18.

Test for water shut-off satisfactory.

Well No. 42, Peshine, drill. P 3-93.

Requested more accurate elevation. Drilling program approved.

Well No. 42, Peshine, shut off. T 3-99.

Test for water shut-off satisfactory.

Well No. 42, Peshine, deepen. P 3-175.

Proposal to deepen from 1540′ to 1670′ rejected. Recommended deepening and testing by 30′ stages.

Well No. 42, Peshine, deepen. P 3-194.

Company submitted additional data, see Report P 3-175, above, showing that Peshine No. 3 was drilled to a greater stratigraphic depth, than proposed for No. 42, without encountering water. This department therefore recommended to drill ahead "dry" 50′ and at the new depth bail the hole dry and let stand 12 hours for test. Further deepening depends upon result of said test.

Well No. 51, Peshine, shut off. T 3-55.

Test for water shut-off satisfactory.

Associated Oil Co.—Continued.
Well No. 52, Peshine, drill. P 3-94.
Proposed drilling program approved.
Well No. 52, Peshine, shut off. T 3-120.
Well No. 61, Peshine, drill. P 3-92.
Proposed casing program approved.
Well No. 61, Peshine, shut off. T 3-129.
Test for water shut-off satisfactory.
Well No. 137, Peshine, drill. P 3-95.
Proposed drilling program approved.
Well No. 137, Peshine, shut off. T 3-119.
Test for water shut-off satisfactory.

SECTION 20.

Associated Oil Co.
Well No. 1, Peshine, shut off. T 3-2.
Test for water shut-off satisfactory.
Well No. 3, Peshine, drill. P 3-174.
Proposed casing program approved.
Well No. 3, Peshine, shut off. T 3-117.

Temporary formation shut-off made with 12½″ casing at 128′ shoe driven 20′ into blue shale. Hole drilled dry to 1324′. Hole bailed dry for test and showed no water was encountered below depth of temporary shut-off.

Well No. 3, Peshine, shut off. T 3-126.

As set forth in report No. T 3-117 no water was logged below depth of 128′. 10″ casing was mudded and cemented at 1324′. Test for water shut-off satisfactory.

TODOS SANTOS RANCHO.

Shell Company of California.
Well No. 1, Newhall Tract, drill.
Proposed drilling program approved.
Well No. 1, Newhall Tract, shut off. T 3-32.
Test for water shut-off satisfactory.
Well No. 1, Newhall Tract, drill, supplementary. P 3-57.

Proposal to cement string at 10″ casing at 1840′ instead of 12½″ 45-lb. casing at 2000′ approved.

Well No. 1, Newhall Tract, shut off. T 3-49.
Test for water shut-off satisfactory.
Well No. 1, Newhall Tract, shut off. T 3-97.
Test for water shut-off satisfactory.
Well No. 1, Newhall Tract, cement. P 3-117.
Supplementary proposal to cement 10″ casing at 2795′ approved.
Well No. 1, Newhall Tract, drill, supplementary. P 3-169.
Proposal to cement string of 8¼″ casing at 3245′ approved.
Well No. 1, Newhall Tract, drill, supplementary. P 3-195.
Proposal to prospect ahead and determine depth of next shut-off approved.

Union Oil Company of California.
Well No. 2, Escolle, cement. P 3-51.
Proposal to cement string of 8¼″ casing at 1860′ approved.
Well No. 3, Escolle, shut off. T 3-56.
Test for water shut-off satisfactory.
Well No. 4, Escolle, shut off. T 3-101.
Test for water shut-off satisfactory.
Well No. 6, Escolle, shut off. T 3-26.
Test for water shut-off satisfactory.
Well No. 7, Escolle, drill. P 3-87.
Proposed casing program approved.

Union Oil Co.—Continued.

Well No. 7, Escolle, shut off. T 3-95.

Test for water shut-off satisfactory.

Well No. 8, Escolle, drill. P 3-132.

Proposed casing program approved.

Well No. 8, Escolle, shut off. T 3-100.

Test for water shut-off satisfactory.

Well No. 9, Escolle, drill.

Proposed drilling program approved.

Well No. 9, Escolle, drill, supplementary. P 3-134.

Amending stated location of well; proposed casing program approved.

Well No. 9, Escolle, shut off. T 3-123.

Test for water shut-off satisfactory.

Well No. 10, Escolle, drill. P 3-162.

Proposed drilling program approved.

Well No. 11, Escolle, drill. P 3-163.

Proposed drilling program approved.

T. 9 N., R. 35 W., S.B.B. & M.

PUNTA DE LA LAGUNA RANCHO.

Associated Oil Co.

Well No. 4, Morganti, drill. P 3-119.

Proposed casing program approved.

Well No. 4, Morganti, drill, supplementary. P 3-126.

Casing estimates changed on account of reported error in elevation. Revised estimates approved.

Well No. 4, Morganti, shut off. T 3-114.

In making bailing test for water shut-off with 12½″ casing at 960′ it was found that the fluid level had risen 521′ in 12 hours. The test indicated that another water stratum had been entered or else the shut-off was a failure. However, in view of the fact that no water had been logged at this stratigraphic depth in neighboring wells and 150 sacks of cement had been used for a shut-off, this department decided that the water was coming into the hole from some source other than around the shoe and strongly urged the company to test casing for collar leaks due to insufficient tightening.

The company ran a casing tester and found casing leaking at the rate of 670 gals. per day. The casing was screwed up 26 inches. After casing was tightened the tester showed one pint of water at a depth of 945′ in one-half hour.

Well No. 4, Morganti, shut off. T 3-132.

The 10″ 40-lb. casing was mudded and cemented at 1472′. It was reported that the hole below 960′ was mudded, using a large quantity of mud, but that the mud *did not appear* at the surface. The foregoing is an indication of the porosity of the fracture zones in the Casmalia field shales. Shales were mudded for the purpose of preventing surface waters from working down through fractures into the oil zone.

Test for water shut-off satisfactory.

Well No. 5, Morganti, drill. P 3-189.

Proposed casing program approved.

Well No. 25, Morganti, drill. P 3-120.

Proposed casing program approved.

Well No. 33, Morganti, drill. P 3-190.

Proposed casing program approved.

Well No. 34, Morganti, drill. P 3-121.

Proposed casing program approved.

Well No. 43, Morganti, shut off. T 3-68.

Test for water shut-off satisfactory.

Well No. 43, Morganti, shut off. T 3-102.

Test for water shut-off satisfactory.

Associated Oil Co.—Continued.

Well No. 45, Morganti, cement casing. P 3-25.

Proposal to cement string of 8¼″ casing approved.

Well No. 45, Morganti, make pumping test. P 3-109.

Proposal to make pumping test in lieu of bailing test approved.

Well No. 45, Morganti, shut off. T 3-80.

Pumping test; see P 3-109 for water shut-off not satisfactory. Approval withheld awaiting further results of pumping.

Well No. 53, Morganti, shut off. T 3-44.

Test for water shut-off satisfactory.

Well No. 53, Morganti, shut off. T 3-62.

Test for water shut-off satisfactory.

Well No. 54, Morganti, shut off. T 3-38.

Test for water shut-off satisfactory.

Well No. 54, Morganti, shut off. T 3-48.

Test for water shut-off satisfactory.

Well No. 55, Morganti, shut off. T 3-54.

Recommended mudding and cementing another string of casing.

Well No. 55, Morganti, shut off. T 3-82.

Test was made to determine practicability of mudding formations back of 10″ casing, see report T 3-54. Pumps could only deliver 1 bbl. of water per minute into formation, under 300 lbs. pump pressure, and it was therefore decided mudding was not necessary.

Well No. 55, Morganti, shut off. P 3-159.

Proposal to mud and cement string of 8¼″ casing approved.

Well No. 55, Morganti, shut off. T 3-115.

Bailing test impracticable account of heaving shale and rise of oil fluid. Well passed for pumping test.

Pinal Dome Oil Company.

Well No. 1, Elizalde, abandon. P 3-5.

Proposal to abandon approved.

Union Oil Company of California.

Well No. 2, Elizalde, drill.

Proposed casing program approved.

Well No. 2, Elizalde, shut off. T 3-83.

Test for water shut-off satisfactory.

SECTION 3.

United Western Consolidated Oil Co.

Well No. 1, shut off. T 3-12.

Test for water shut-off satisfactory. Bailer showed 5 gals. black sulphur water.

Well No. 1, drill, supplementary. P 3-168.

Proposal to cement 8¼″ casing at 1627′ in order to test for productivity of formations below that depth approved.

Well No. 1, shut off. T 3-122.

Test for water shut-off satisfactory.

SECTION 14.

Contra Costa Oil Syndicate.

Well No. 1, drill. P 3-111.

Proposed drilling program approved.

QUINTERO LEASE.

Union Oil Company of California.

Well No. 1, shut off. T 3-42.

The company reported that 12½″ 40-lb. casing collapsed, after cementing and bailing at about 1200′. The casing was swaged. Bailing test showed water coming into the hole. The well, being a prospect well, was passed for further drilling, with the understanding that in case productive formations were entered another string of pipe would be cemented to protect same.

T. 10 N., R. 35 W., S.B.B. & M.

Standard Oil Company.

Well No. 1, abandon. P 3-22.

Work of abandonment approved identically as proposed.

Well No. 1, abandon. P 3-114.

Requirements of department, for abandonment, based on all information filed, have been complied with.

TOGNAZZINI LEASE.

Standard Oil Company.

Well No. 1, abandon. P 3-23.

Proposal to plug and abandon approved.

Well No. 1, abandon. P 3-113.

Requirements of department, for abandonment, based on all information filed, have been complied with.

CHAPTER VI.

KERN, TULARE AND INYO COUNTIES.

By R. N. FERGUSON, Deputy Supervisor.

District.

In the district, covered by Kern, Tulare and Inyo counties, the developed oil fields all lie within the boundaries of Kern County. There are four groups of fields in all. In certain instances the groups contain several more or less distinct fields. The Kern River field is the only field on the east side of the San Joaquin Valley. On the west side of the valley there are the Sunset-Midway-McKittrick group of fields; the Belridge-North Belridge, or Hopkins-Lost Hills group, and the Devils Den field which is as yet undeveloped.

Organization.

The work of this department for the fields mentioned, is conducted from the office of the State Mining Bureau at Taft. A branch office is maintained at Bakersfield for the purpose of facilitating inspection, witnessing tests of water shut-off, and other field work required by law. All field work on the west side of the valley is handled by engineers and inspectors working out of the office at Taft.

General Summary.

During the year there were 435 new drilling wells reported as compared with 682 wells during the year previous. This falling off in drilling activity was general throughout all fields except Sunset where a decided increase was shown. In the Lost Hills and Kern River fields the decrease was partly due to the completion of drilling campaigns by certain companies but in general it was ascribed to scarcity of drilling materials. There were 364 wells deepened or redrilled during the year. This is a slight increase over this class of jobs for the year previous. There is little change in the number of abandonments as compared between this year and last year.

The number of decisions issued on proposed operations and tests for water shut-off are a good indicator of the amount of work required of this department in the various fields. In addition to this more or less routine work the task of assembling data and making special investigation of a number of formal complaints has been a large one.

Table No. 1, which follows, summarizes the operations that have been carried on in the various fields of the district during the year:

TABLE I. OPERATIONS DISTRICT FOUR, 1917-1918.

Field	New wells		Deepen or redrill		Abandon		Test shut-off		Special tests
	Notices	Decisions	Notices	Decisions	Notices	Decisions	Notices	Decisions	Decisions
Sunset	95	133	54	68	13	33	139	191	62
Midway	204	223	170	206	53	59	278	371	64
McKittrick	19	32	23	25	8	9	30	42	5
Belridge	47	83	14	16	5	7	79	101	4
North Belridge	16	28	4	5	2	2	12	21	------
Lost Hills	22	40	22	27	7	14	19	35	1
Kern River	30	32	76	89	8	11	71	84	24
Wild Cat	2	3	1	1	1	1	1	1	1
Totals	435	579	364	438	97	136	628	846	161

Total reports on proposed operations 579 + 438 + 136 = 1,153
Total reports on tests 1,007 = 846 + 161
Total decisions issued 2,160

Records.

The status of records furnished the department, to the end of the fiscal year, is shown in Table II. It will be noted that the production reports filed account for 4458 wells. Our information from other sources is to the effect that 4837 wells in the district are producing oil. The production reports therefore account for 95 per cent of the producing wells and 63 per cent of all wells drilled.

TABLE II. Records Filed.

Field	Wells drilled, completed, idle, and abandoned	Logs filed	Number of wells accounted for by production reports	Number of producing wells for which production reports are filed
Sunset	838	394	461	411
Midway	2,450	1,915	1,326	1,229
McKittrick	580	377	207	205
Belridge	263	187	152	142
North Belridge	40	27	19	19
Lost Hills	417	340	340	337
Kern River	2,456	1,849	1,953	1,883
Wild Cat	25	5	------	------
Totals	7,099	5,094	4,458	4,226

Appeals to Commissioners.

During the year the Board of Commissioners heard one *informal* appeal from a recommendation of the Deputy Supervisor and one formal appeal from an order of the State Oil and Gas Supervisor.

The *informal* appeal was that of Baker & Henshaw from the recommendation of the deputy in the matter of the method of abandonment of Baker and Henshaw well No. 2, Section 12, T. 26 S., R. 20 E., M. D. B. & M., as contained in report No. P-4-927, dated December 22, 1917. The recommendation appealed from was as follows:

> "The well should be cleaned out to original bottom, 1880′, the bottom of the hole should be thoroughly mudded under pressure and a cement plug placed from 1880′ to 1845′. The hole should then be plugged with clay up to 1800′ and a cement plug placed at that depth after which the plugging with clay should proceed up to a depth of 1600′ where another cement plug should be placed. The hole should then be plugged with clay up to 1265′ where a cement plug should be placed that will extend up into the 8¼″ casing at least 10′ or to 1243′. The 8¼″ casing should then be freed and pulled up and the formations below the shoe of the 10″ casing (landed at 1211′) should be thoroughly mudded under a pressure of 400 lbs. If the 10″ casing can be loosened it should be pulled and a cement plug placed against the walls of the hole from 1210′ to 1195′. If the 10″ can not be loosened, it should be shot between 1210′ and 1195′ and the shot cavity filled with cement. If the 10″ casing can be freed it should be pulled, and as it is pulled back, the hole should be mudded under pressure. In the event it does not free, the 10″ should be ripped at the following depths (or until it comes free): 1180′-1195′, 1030′-1130′, 870′-1010′, 730′-812′, 570′-620′, and mud pumped out through the rips under pressure. A cement plug should be placed against the walls of the hole from 870′ (shooting the 10″ casing if necessary) up in 12½″ casing to 550′. If the 12½″ casing can not be freed at 550′, it should be shot and a solid cement plug placed against the walls of the hole between the depths of 480′ to 550′. A cement plug should be placed against the walls of the hole between 400′ and 457′ and between 365′ and 377′. The hole should then be mudded under pressure and a solid clay plug placed against the walls of the hole from 365′ up to 147′. The hole should then be filled with surface formation to the top."

The hearing was held on March 20, 1918, and the decision of the commissioners was as follows:

> "That Baker and Henshaw be required to clean the well out to a depth of 1670′, either by rotating down with tubing or by carrying a string of casing, and pump in sufficient cement to fill the hole up to within 15′ or 20′ of the shoe of the 8¼″ casing, in the presence of a representative from the State Mining Bureau, and that the abandonment of the hole from that point be done in accordance with the recommendation of the Deputy Supervisor, making use of any modification of previous recommendations that seem warranted by the developments resulting from the work on the lower portion of the hole."

A further hearing of the case was held on April 24, 1918, at which time Baker and Henshaw requested certain modifications in the work outlined. The commissioners reaffirmed their decision of March 20, 1918.

The formal appeal, above referred to, was that of Union Oil Company from Order No. 5 of the Supervisors relative to method of drilling, prospecting, and shutting off water in well No. 7 (International), Section 4, T. 11 N., R. 23 W., S. B. B. & M. The commissioners, at a special meeting on May 4, 1918, reversed the order of the Supervisor and upset all previously accepted practices as to the protection of oil sands from infiltrating water. The matter is fully set forth as follows:

ORDER NUMBER FIVE—STATE OIL AND GAS SUPERVISOR.

April 22, 1918.

To Union Oil Company of California:

The question as to the proper method of drilling oil wells with a view to protecting the oil deposits in the vicinity of Sec. 4, T. 11 N., R. 23 W., S. B. B. & M., in the Maricopa Flat, Kern County, California, has been particularly brought to the attention of the State Oil and Gas Supervisor on several occasions. The method pursued or proposed by the Union Oil Company in the drilling of wells in the said locality has been the subject of much correspondence and discussion between the Supervisor and said Company, and other companies operating in the neighborhood.

The question was first brought particularly to the attention of the Supervisor by letter of complaint dated August 23, 1916, and written by Howard M. Payne, Receiver.

The question was made the subject of a public conference at Taft, California, on July 27, 1917, which was held at the request of the Union Oil Company. The Supervisor presided at the meeting, which was attended by representatives of the Union Oil Company and by representatives of other concerns operating in the aforementioned locality. A complete written record of the proceedings was kept in such form as to show all correspondence beginning with the original letter of complaint, dated August 23, 1916, and also all remarks made. A copy of the written record was furnished to the Union Oil Company and to other operators; a copy is on file with the Supervisor, and reference is hereby specifically made to said record.

The record of the said public conference shows that International well No. 6, belonging to the Union Oil Company, was the special subject of discussion. The record also shows that previous to that time, namely, on November 1, 1916, the operators of the locality had held a meeting for the purpose of discussing methods of protecting the oil deposits, and advising the Supervisor as to their opinions. Written opinions were furnished to the Supervisor by several parties, but not by the Union Oil Company, and the record does not disclose whether or not the said Company was at that time co-operating with the neighboring operators. An assumption that there had not been complete co-operation seems justified by statements of representatives of the Union Oil Company at the meeting of July 27, 1917 (page 134 of transcript), to the effect that objections and opinions of neighbors had not previously come to the attention of said company.

The record shows that under date of November 28, 1916, after receipt of written opinions from various operators, the Supervisor formulated a policy for protecting the oil deposits. The said policy specified two methods of drilling wells for two different underground geological conditions. One method provided that a string of casing should be cemented and tested above the top producing oil sand; the second method provided for cementing a string of casing below the top oil sand in case certain formations were found to be more than 400 feet apart.

In view of all the facts before the Supervisor after the public conference of July 27, 1917, a written recommendation and requirement as to the method of drilling International well No. 6 was furnished to the Union Oil Company by Deputy Supervisor R. N. Ferguson, under date of July 28, 1917. Said recommendation and requirement provided for cementing and testing a string of casing above the top sand, and definitely rejected a proposal to carry the casing below said top sand. The recommendation and requirement were based upon further study, investigation and new facts, and it therefore amended the policy of November 28, 1916, and eliminated the alternative method which allowed casing to be cemented below the top sand. Since the issuance of the recommendation and requirement of July 28, 1917, approval has been given only to proposals to land and cement above the top sand. The previously announced alternative method of cementing casing below the top sand was abandoned because it was found that in the case of a failure of water shut-off, by use of mud and cement, it is difficult, if not impossible, to protect the said top sand. This was specifically demonstrated in March, 1917, at Pat Welch well No. 4, on Sec. 4, and at Southern Pacific well No. 31, on Sec. 5, all in T. 11 N., R. 23 W., S. B. B. & M.

The policy of requiring that casing be cemented above the top sand was again definitely stated in writing by Deputy Supervisor R. N. Ferguson, under date of August 24, 1917, in a formal report to the Union Oil Company, in reply to their proposal to drill International well No. 7, said proposal bearing date of August 21, 1917. The Union

Oil Company agreed to said policy and ruling, as is shown in their proposal dated January 13, 1918, which states that the intention had previously been to cement the 10-inch casing at a depth of 2840 feet.

The Union Oil Company, however, proposed, under date of January 13, 1918, to complete International well No. 7 by a method not in accord with the policy requiring that casing be cemented and water shut off immediately above the top oil sand. The reason of the company for wishing to depart from the policy is that it has failed in its proposed program of mechanical operations at said well No. 7. No facts are set forth tending to show that the underground geological conditions as to water and oil sands are different from those originally assumed in formulating the policy for protection.

It can not be too emphatically and clearly set forth that, if failure of an operator to successfully carry out a mechanical operation were to be accepted as excuse for altering requirements, the legal regulation of drilling operations would immediately fall to the standard of operations set by the most inefficient operator in the State, and the law would be rendered null and void. The tendency to excuse and assist an operator who has been unfortunate in mechanical operations is a constant temptation to any official who desires to assist operations rather than to simply retard and drastically regulate them. Therefore, the logical outcome of any policy must be kept clearly and constantly in mind.

Sec. 3, Chapter 718, Statutes of 1915, amended 1917, reads as follows:

> "It shall be the duty of the state oil and gas supervisor so to supervise the drilling, operation and maintenance and abandonment of petroleum or gas wells in the state of California, as to prevent, as far as possible, damage to underground petroleum and gas deposits from infiltrating water and other causes and loss of petroleum and natural gas."

After the mechanical difficulty which prevented the Union Oil Company from carrying the 10-inch casing deeper than 2570 feet, or about 270 feet above the probable position of the top sand, there was considerable discussion between representatives of the company and the Supervisor as to the method of completing the well. An agreement was not arrived at, and the company requested that the matter be referred to the District Oil and Gas Commissioners.

In order to place the matter formally before the said Commissioners, it became necessary, according to the provisions of the law, for the Supervisor to issue a formal order directing certain procedure at the well. For the purpose of assembling and considering all evidence upon which a formal order should rest, a formal hearing was held by the Supervisor at Taft on April 9, 1918. A complete written record of the proceedings was kept, and is hereby referred to.

The District Oil and Gas Commissioners were notified to attend, and did attend, the hearing for the purpose of being fully informed should the order of the Supervisor be appealed to them.

The assembling of evidence as to underground conditions was considered to be of such importance that the Supervisor detailed several engineers and geologists from other districts of the State to the study of the subject at hand. All but purely routine work in the fourth district was laid aside in order that this particular locality could be investigated. The Union Oil Company was given notice that complete technical and geological information would be gathered, and that the Supervisor hoped that the company would co-operate in such work to the same extent that neighboring operators had already done. The Supervisor has repeatedly called the attention of the company to the fact that engineering and geological study of a locality must precede and accompany the mechanical work of drilling if oil deposits are to be properly protected from damage. Notwithstanding the requests for co-operation in technical work, the company failed to give it. The extent of such failure may be judged by the fact that the company did not even furnish a map accurately showing the location and elevation of its own wells. The failure of the company to co-operate in the matter of technical information is further shown by the fact that at the formal hearing the company was represented solely by its superintendent, Mr. George Kammerer, who is highly skilled in the mechanical details of well drilling, but lays no claim to knowledge of engineering or geology.

The disadvantage and nervous strain under which Mr. Kammerer labored in attempting single-handed to present his contentions and opinions on technical subjects was one of the most lamentable features of the hearing. That the officers of a company as large as the Union Oil company should have so little knowledge or concern as to the difficulty of correctly ascertaining the facts governing the protection of oil deposits is the most astounding feature of the inquiry. If a studied effort had been made by the officers of the company to discredit the administration of the law, the result could not have been better achieved than by placing their sole representative in such a position of tension and anxiety that he did repeatedly make contemptuous and derogatory remarks as to the fairness and integrity of the officers of the law.

The extent to which the company is uninformed as to invisible underground conditions and facts vitally affecting the control of water at their oil wells may be judged by certain testimony of their representative, Mr. Kammerer (page 149 of transcript), relative to ground surface conditions readily observable at International well No. 5:

> "Mr. McLaughlin. In this particular well, No. 5, is there not water flowing outside the casing?

Mr. Kammerer. If there was I don't know it.

Mr. McLaughlin. I was at the well yesterday, and I thought there was water outside of the casing.

Mr. Kammerer. No.

Mr. McLaughlin. Maybe we were mistaken."

Since the hearing, a representative of the Supervisor, Mr. McGregor, petroleum engineer, has visited said well No. 5 and actually confirmed the observation of the Supervisor that water is flowing from behind the casing.

The hearing was conducted for the purpose of considering the physical facts as to underground conditions at International well No. 7, belonging to the Union Oil Company. The facts are developed by study of the observed conditions in wells of the immediate vicinity, and are as follows:

1. There is an anticlinal fold in the formations underlying the land in question. The axis of the fold runs southeasterly through a point near International well No. 4. The axis of the anticline plunges or becomes lower as it is followed toward the southeast.

2. The number of strata carrying either water or oil is extraordinarily great and presents one of the most difficult problems encountered in California, so far as protection of oil sands from damage by water is concerned. However, detailed and careful study shows remarkable persistence and regularity of geological conditions. There are no less than nine separate and distinct beds of sand carrying oil and occurring within a vertical range of about 900 feet. There are at least three strata or groups of strata carrying water. For convenience of description, the oil-bearing strata have been grouped into three zones. The water-bearing zones have been chosen as the division lines between the three oil-bearing zones.

Zone "A" is the uppermost or top oil sand, and is less than 100 feet in thickness. Less than 50 feet above it is a zone carrying water and referred to as the "lowest top water."

Zone "B" is almost 100 feet below zone "A," and is nearly 200 feet thick. Between zones "A" and "B" is a water-bearing zone referred to as the "upper flowing water."

Zone "C" is about 400 feet thick, and is about 100 feet below zone "B." Between zones "B" and "C" is a water-bearing zone referred to as the "lower flowing water."

3. Zone "A" has been encountered and identified in at least twenty-three wells on portions of Sections 4 and 5, T. 11 N., R. 23 W., and Section 32, T. 12 N., R. 23 W., S. B. B. & M., and immediately adjoining the property of the Union Oil Company known as the "International," being the southeast quarter of the northwest quarter of Section 4, T. 11 N., R. 23 W., S. B. B. & M. One well, namely, International No. 1, directly upon the said International property, encountered and actually produced oil from zone "A."

Testimony of witnesses was practically unanimous in the opinion that zone "A" extends under the International property.

At least twenty-two of the wells in the aforesaid sections 4, 5 and 32, have produced oil from zone "A." The total production has been not less than 1,433,173 bbl. of oil ranging from 18° to 22° Baumé. The average daily production of individual wells ranges from 38 to 500 bbl. of oil. There have been about 496,417 bbl. of water lifted with the oil from zone "A," or about one bbl. of water to every three bbl. of oil. The thickness of the productive oil sand in zone "A," as reported by logs of wells, ranges from 3 to 20 feet, the average being 10 feet.

4. Zone "B" has been encountered in at least nine wells in said Sections 4, 5 and 32. Five of the wells have produced a total of at least 1,226,850 bbl. of oil ranging

from 24° to 26° Baumé. The average daily production of individual wells ranges from 50 to 520 bbl. of oil. There have been about 224,002 bbl. of water lifted with the oil from zone "B," or about one bbl. of water to every six bbl. of oil. The thickness of the productive oil sands, as reported by logs of wells, ranges from 6 to 15 feet, the average being 10 feet.

5. Zone "C" has been encountered in at least 26 wells in said sections 4, 5 and 32. Twenty-four of the wells have produced a total of at least 12,175,550 bbl. of oil ranging from 18° to 27° Baumé, most of it being above 24°. The average daily production of individual wells ranges from 5 to 30,000 bbl. of oil. There have been about 1,211,995 bbl. of water lifted with the oil from zone "C," or about one bbl. of water to every 10 bbl. of oil. The thickness of the productive oil sand, as reported by logs of wells, ranges from 6 to 86 feet, the average being 22 feet.

6. Records of drilling operations show that at none of the wells drilled by the Union Oil Company on the International property were proper and sufficient tests made for the purpose of proving or disproving the presence of zone "A." The Company states that considerable sums of money were spent in conducting tests and trying to locate zone "A," but in the face of records showing that water had access to the formations at the time search was conducted, it would have been difficult, if not impossible, to establish the nature of the formations. It is not an uncommon occurrence for wells to pass through productive oil formations without discovering their nature, and the mere expenditure of money can not be considered as a detailed test or search. Furthermore, diligent inquiry on the part of the Supervisor has failed to disclose that the Union Oil Company made careful geologic study and comparison of well logs in the locality. Thorough geologic study has been shown to be a necessary step in the discovery and identification of zone "A." Such a study would necessitate data accurately locating all wells and showing their elevations, and as the Company could not furnish the Supervisor with such primary information, we are justified in stating positively that the Company had not made careful geologic study and comparison in the effort to locate zone "A."

The large production obtained from zone "C" is ample explanation for a policy which would temporarily disregard the possibilities of smaller profit from zone "A," and earnest, but misdirected, efforts to find zone "A" might readily lead to a belief that it did not exist. There is, however, ample evidence both of the existence and value of zone "A," and the Supervisor is therefore not justified in approving methods of drilling which do not protect it so far as possible from water. It is not the intention of the Supervisor to insist that the Company shall produce from either zone "A" or zone "B."

7. The cost of casing is the largest single item of expense in the drilling of wells, and is sometimes increased where extra precautions are taken to protect formations from water. In this locality, however, a comparison of casing costs at seventeen wells shows that wells which definitely located zone "A" before drilling to zone "C" each cost, on the average, $254 more than those which did not definitely locate zone "C." The average cost of casing in the latter case is $22.035, and therefore the increased cost is about one per cent.

8. It is impossible, under methods previously followed, for the Company to correctly determine the nature of formations passed through in drilling. This is demonstrated by comparison of the logs of International wells Nos. 2 and 6, which are located less than 30 feet apart, but fail to record the same formations, although it is practically a certainty that actual conditions in the wells are not only similar, but identical.

9. As has already been shown, water in considerable quantities and proportion has been given access to zone "A." Therefore, some damage to the zone has already been done, and in the light of other similar conditions, the damage may at any time reach great proportions. Protective measures can not be postponed awaiting overwhelming damage.

10. Comparison of the amounts of water produced from each of the various wells herein mentioned, and situated in Sections 4, 5 and 32, shows that all of the Inter-

national wells of the Union Oil Company are producing water in large and damaging amounts. Furthermore, the said wells of the Union Oil Company show larger amounts of water than most of the other wells within the neighborhood. This condition may directly affect the well covered by this order, and notice is hereby given that the Supervisor will expect proposals at an early date looking to the testing and repairing of various International wells. When water trouble develops at a well, the first and most obvious place, in the absence of other evidence, to look for the cause, is within the well itself.

CONCLUSION.

The present shortage of oil, as well as casing, gives cause for serious reflection before the issuance of an order which either postpones the production of oil or requires an increase in the amount of casing to be used. On the other hand, the protection of the oil bearing deposits is of prime necessity, particularly at the present stage of national necessity.

It is believed that more prompt and satisfactory agreement between an operator and the Supervisor can be arrived at by less formal methods than have been followed in this case, *providing* the operator is prepared to meet the Supervisor in the matter of co-operation in the necessary engineering and geological work. As previously intimated, the Supervisor is prepared to insist that the highest standard of operating methods shall be followed. In fairness to the Union Oil Company, it may be said that certain of its statements and actions, not concerned in the matter immediately under consideration, indicate that in future their work will be preceded by technical investigation and direction equal to the best usage of other operators and therefore equal to the standard required by the Supervisor.

Conditions at International well No. 7, as shown by proposals, reports and correspondence passing between the company and the Supervisor, are as follows:

The Company proposed (August 21, 1917) to drill the well to encounter oil sand (zone "C") at a depth of 3375 feet; water to be shut off by cementing 10-inch casing at a depth of 2900 feet and 8¼-inch casing at 3300 feet.

The Supervisor recommended (August 24, 1917) that 10-inch casing be landed at about 2800 feet and above the top oil sand (zone "A"). The Supervisor later (October 22, 1917) approved proposal to land the water string as deep as 2850 feet.

After mechanical trouble, which left the 10-inch casing cemented at 2570 feet and the bottom of the hole at 2840 feet, the Company (January 13, 1918) proposed to test for water immediately below the 10-inch casing, and, if no water was found there, to make another test for water with perforated casing open to a depth of 2840 feet. If the latter test showed no water, drilling was to continue to a depth of 3375 feet. No mention of test or protection of zone "A" was made.

The Supervisor (January 17, 1918) approved the two proposals to test for water, but in addition recommended that if it were found, which contingency was not covered by the proposal, it should be shut off by cementing 8¼-inch casing at 2840 feet. It was also recommended that, with water either absent above or shut off at 2840 feet, the well should be drilled to a depth of 2875 feet and tested for oil (zone "A"). If the test for oil did not discover it, drilling was to proceed to 3375 feet.

The company wrote (January 26, 1918) that they preferred to use 6¼-inch casing instead of 8¼-inch casing to a depth of 2840 feet, as it could be more easily removed.

The Supervisor wrote the company (January 26, 1918) that no proposal to pull casing was on file.

The company wrote (January 30, 1918) explaining why 6¼-inch casing could be more easily removed. The letter further stated that with casing cemented at 2840 feet, the hole would be ruined so far as reaching the deeper (zone "C") sand.

The Supervisor (January 30, 1918) wrote the company that the productiveness of zone "A" in adjoining wells demanded its protection by cementing at 2840 feet, and that the larger sized casing would be advisable. Although the letter did not specifically point out that the use of the larger size casing would permit drilling to the deeper (zone "C") sand, attention is hereby directed to that fact.

Subsequent correspondence was relative to hearing, formal order and appeal.

The company (April 5, 1918) proposed to carry 8¼-inch casing to 3300 feet, as they did not want to "waste any more time to test out first oil sand." This proposal was actually received by the Supervisor on the date of the investigation and hearing. It indicates little except irritation at any regulation based on an investigation into facts, and was therefore disregarded by the Supervisor.

It will be noted from the previous facts that had the company merely acceded to the recommendation of the Supervisor in the use of 8¼-inch casing, the well would doubtless have been completed some time since and would now be producing from either zone "A" or zone "C."

It will also be noted that various proposals by the company were indefinite or incomplete, in that they did not cover all their proposed operations, nor did they provide for contingencies aside from the limited underground conditions assumed by the company.

Although there is lack of definiteness in written proposals and letters, it appears that quite recently the company has been willing to make some tests for the purpose of proving or disproving the existence and productiveness of zone "A" at International well No. 7. Assuming such intent, it is necessary, in view of the character of previous operations by the company, to specify rigid tests establishing the nature of the formations. It is also necessary to specify certain depths between which said tests shall be made. The depth must include a greater thickness of formations to be tested than would appear to have been contemplated by the company in limiting its willingness to conduct tests.

It is therefore hereby ordered that the following operations shall be performed for the purpose of definitely locating the first or top productive oil sand, and for the further purpose of excluding from it all waters encountered at lesser depths in the well.

1. Effect a water shut-off by cementing a string of casing at a depth of 2840 feet in the following manner:

   (*a*) Clean well out to depth of 2840 feet.
   (*b*) Cement casing at 2840 feet with sufficient cement to reach up to a depth of 2810 feet.
   (*c*) Allow cement to set for at least 10 days.

(*d*) Drill out cement to a depth not to exceed 2845 feet.

(*e*) Bail fluid and test in the usual manner.

2. After a water shut-off has been made at 2840 feet and approved by the Supervisor, the company shall drill, with cable tools, to a depth not to exceed 2860 feet, and make conclusive pumping or bailing tests to determine whether formations between said depths of 2840 and 2860 feet carry either oil or water.

3. Drilling and testing of 15-foot zones of formation shall be continued, in the same manner as hereinbefore specified, until either oil or water-bearing formations are encountered.

4. In the event that in any of the aforespecified drilling and testing operations oil is discovered, the company shall tube the well to a depth satisfactory to the Supervisor and pump same for a period of not less than fifteen days, gauging the production by means of one or more tanks determining accurately the production of oil and of water for each twenty-four hour period during the fifteen days.

5. If, in the aforementioned deepening by 15 foot stages, water-bearing formations are encountered, the hole shall be effectively plugged with cement from the bottom to a depth of 2830 feet. Said plug shall be so constructed as to prevent the upward passage of water into the casing cemented at 2840 feet, and shall be tested to demonstrate its effectiveness. Said test of plug shall be made by removing all fluid from the well to a depth of 2500 feet, and allowing the well to stand for at least twelve hours. After said plug has been tested and approved as effective, the top of the plug shall be cleaned by running a suction pump of the Morahan type. The casing shall then be ripped for the purpose of determining whether or not oil-bearing formations exist above a depth of 2840 feet. There shall be not less than two holes ripped in the casing, each hole to be not less than five feet long, extending between depths of 2825 feet and 2820 feet. After ripping, suction pump shall be run to determine that formation has entered the casing through the rips. In the event that said ripping does not allow the entrance of formation, five pounds of gelatine shall be exploded at a depth of 2822 feet. After it has been demonstrated that formation has entered the casing, the well shall be bailed to determine the presence or absence of oil. In the event that oil is thus shown to exist above a depth of 2840 feet, it will be necessary to protect it from water to the satisfaction of the Supervisor.

6. In the event that no oil-bearing formations are discovered by the hereinbefore specified tests, the well shall be redrilled and casing cemented below the lowest water-bearing formations previously encountered. The depth at which said casing shall be cemented and water shut off shall be determined by the Supervisor. After approval of said water shut-off, the well shall be deepened and tested, by 15-foot stages, as hereinbefore specified.

7. In the event that the foregoing specified tests fail to discover the presence of oil-bearing formations, it will be satisfactory to the Supervisor for the company to cement casing at a depth of 3300 feet, as previously proposed.

8. In the event that the foregoing specified tests prove the presence of oil-bearing formations, it will be necessary to permanently maintain

a shut-off of water by cementing a string of casing above said oil-bearing formation.

9. All tests and operations hereinbefore specified shall be witnessed by and approved by the Supervisor, or a representative duly authorized by him. The company shall notify the Supervisor in writing when it is ready to perform said tests and operations. Said notices shall be delivered at such time as to give reasonable notice and allow the Supervisor time to send a representative to the well.

10. All proposals to deviate from the foregoing specifications must be made by the company in writing before said deviation has been accomplished. No proposal shall be considered as approved by the Supervisor unless it is given in writing by the Supervisor, or his duly authorized representative.

11. Deputy Supervisor R. N. Ferguson is hereby duly authorized to receive written proposals from the company, to issue written approval or rejection of said proposals, and to witness all tests and operations hereinbefore specified. Said Deputy Supervisor is also hereby authorized to designate such persons as may be necessary for the purpose of witnessing tests and operations.

Dated: San Francisco, California, April 22, 1918.

R. P. McLaughlin,
State Oil and Gas Supervisor.

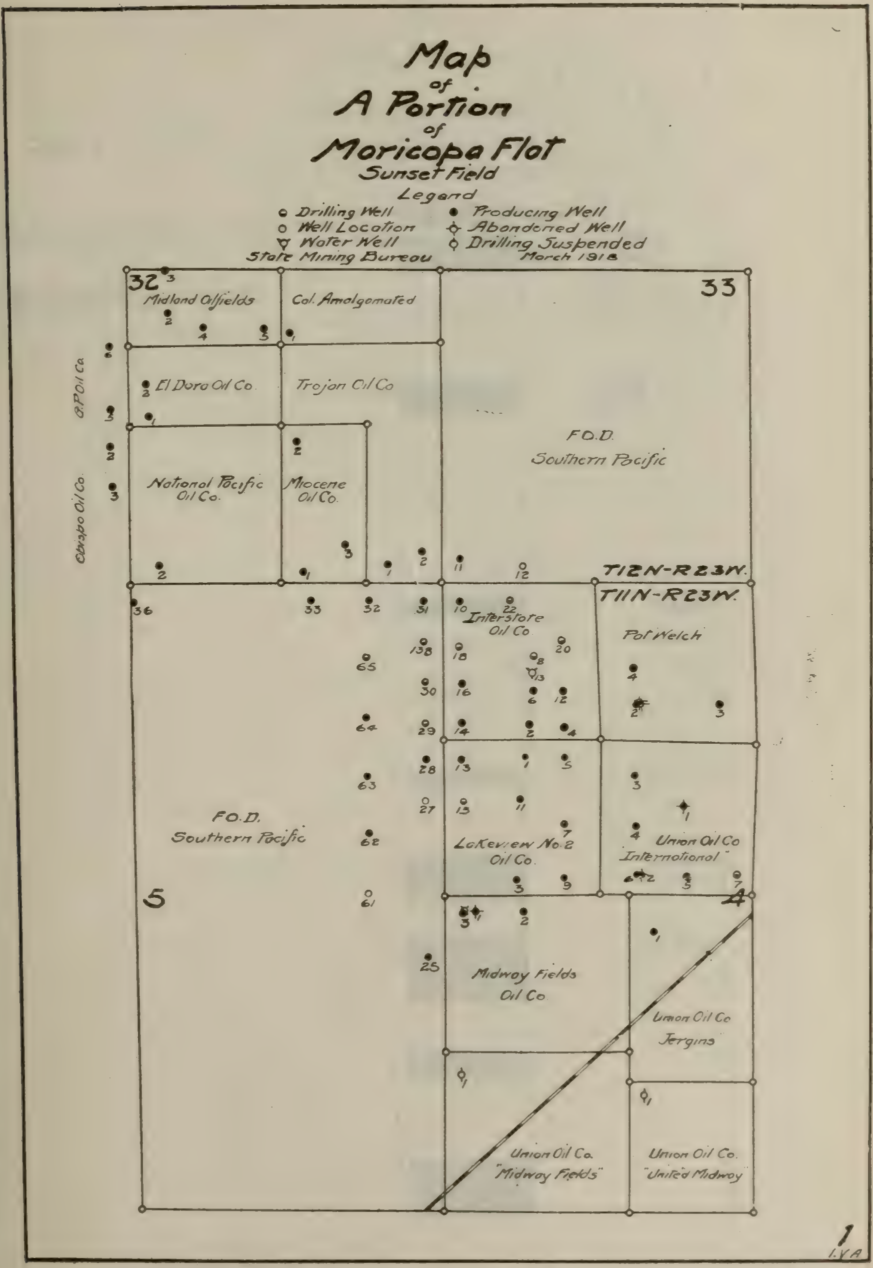
Map
of
A Portion
of
Moricopa Flat
Sunset Field
Legend
Drilling Well
Producing Well
Well Location
Abandoned Well
Water Well
Drilling Suspended
State Mining Bureau
March 1918
32
33
Midland Oilfields
Col. Amalgamated
El Dora Oil Co.
Trojan Oil Co
B.P. Oil Co.
Obispo Oil Co.
National Pacific Oil Co.
Miocene Oil Co.
F.O.D. Southern Pacific
T12N-R23W.
T11N-R23W.
Interstate Oil Co
Pat Welch
F.O.D. Southern Pacific
Lakeview No. 2 Oil Co.
Union Oil Co "International"
5
4
Midway Fields Oil Co
Union Oil Co Jergins
Union Oil Co. "Midway Fields"
Union Oil Co. "United Midway"
I.V.A.

FIG. 15.

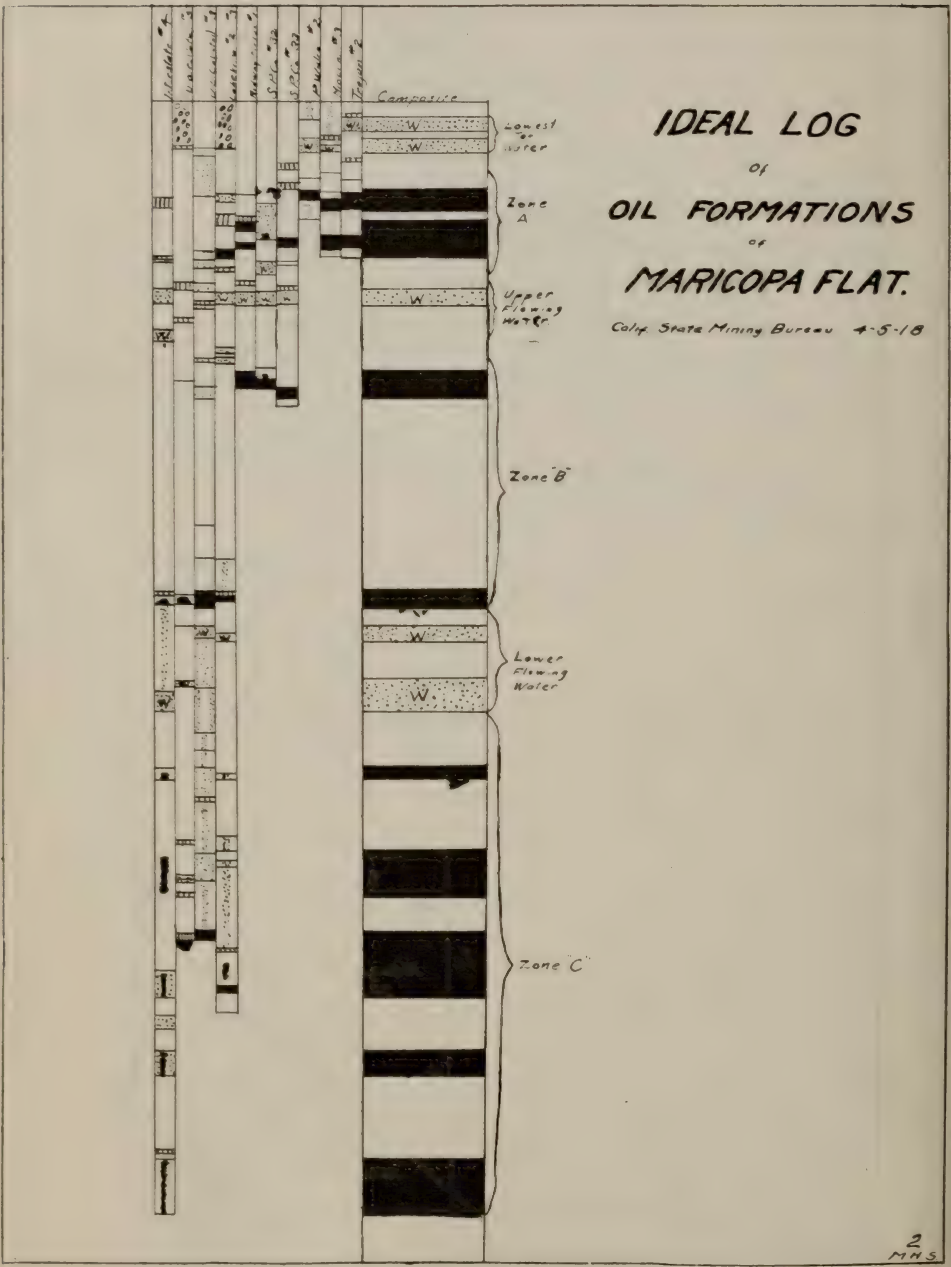
S.P.Co. #32
S.P.Co. #33
Trojan #2
Composite
W
W
Lowest water
Zone A
W
Upper Flowing Water
Zone "B"
W
W
Lower Flowing Water
Zone "C"
IDEAL LOG
of
OIL FORMATIONS
of
MARICOPA FLAT.
Calif. State Mining Bureau 4-5-18
2
MHS

FIG. 16.

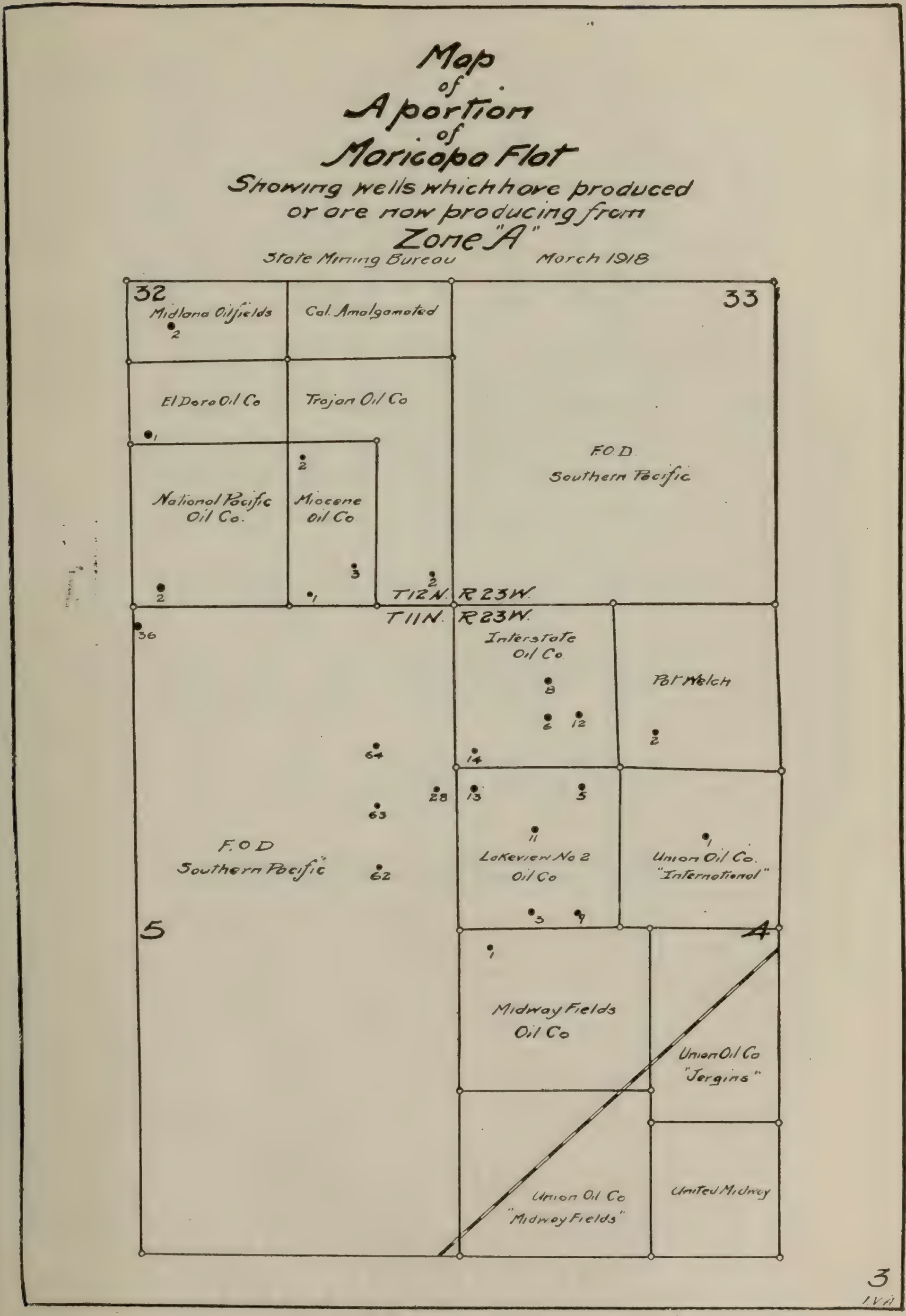
Map
of
A portion
of
Maricopa Flat
Showing wells which have produced
or are now producing from
Zone "A"
State Mining Bureau
March 1918
32
Midland Oilfields
2
Cal. Amalgamated
33
El Doro Oil Co
Trojan Oil Co
1
2
F.O.D.
Southern Pacific
National Pacific
Oil Co.
Miocene
Oil Co
3
2
2
1
T12N. R23W.
T11N. R23W.
36
Interstate
Oil Co.
8
Pat Welch
6
12
2
64
14
28
13
5
63
11
1
F.O.D
Southern Pacific
Lakeview No 2
Oil Co
Union Oil Co.
"International"
62
5
3
7
4
1
Midway Fields
Oil Co
Union Oil Co
"Jergins"
Union Oil Co
"Midway Fields"
United Midway
3
I.V.A.

FIG. 17.

TABULATION OF PRODUCTION FIGURES FOR ZONE "A."

Production to February 1, 1918, in barrels.

Company	Well No.	Section	Township	Range	Date completed	Total oil	Total water	Average per producing day		Average gravity	Thickness of oil sand	Remarks
								Oil	Water			
Southern Pacific	28	5	11N	23W	2/15/18	1,776	14	111	.9	18.9	5′	Prod. for Feb., 1918.
Southern Pacific	36	5	11N	23W	12/14/11	60,461	1,349	74	1.6	21	14′	Production since Oct., 1915.
Southern Pacific	62	5	11N	23W	12/20/17	1,040	2,145	39	79.0	18	6′	
Southern Pacific	63	5	11 N	23W	1/31/18	55	0	55	0	19		New well.
Southern Pacific	64	5	11N	23W	9/19/17	9,043	133	93	1.5	19.1	3′	
Interstate Oil Co.	6	4	11N	23W	4/ 3/16	100,568	7,521	161	12.0	21.3	†	
Interstate Oil Co.	8	4	11N	23W	1/25/17	10,276	3,247	107	34.0		7′	Off production May, 1917.
Interstate Oil Co.	12	4	11N	23W	4/ 4/17	24,804	5,139	93	21.0	21.2	4′	
Interstate Oil Co.	14	4	11N	23W	7/10/17	2,610	1,182	135	6.0	20.1	10′	
Lakeview No. 2	3	4	11N	23W	1/20/14	56,919		140			7′	
Lakeview No. 2	5	4	11N	23W	6/ 5/16	100,485	1,521	169	2.5	21.9	7′	
Lakeview No. 2	9	4	11N	23W	1/14/17	3,192	322	41	4.0		5′	Off production April, 1917.
Lakeview No. 2	11	4	11N	23W	6/ 8/17	7,022	153	38	0.8	21.3	5′	
Lakeview No. 2	13	4	11N	23W	1/15/18	1,278	7	85	0.5	18.0	8′	New well.
Pat Welch	2	4	11N	23W	12/21/17	8,388	1,564	210	39.0	21.0	7′	
Midway Fields	1	4	11N	23W		90,000					5′	See history.
Union "International"	1	4	11N	23W	2/13			75	150.0		4′	See history.
Trojan Oil Co.	2	32	12N	23W	3/ 9/18			225	75.0	17.0	21′	
Midland Oilfields	2	32	12N	23W	8/20/11	270,634	*400,000	336	460.0	23	18′	
National Pacific	2	32	12N	23W	12/ 6/10	2.705		500			12′	
Miocene	1	32	12N	23W	2/27/12	501,214	60.357	250	30.0	19.4	20′	
Miocene	2	32	12N	23W	5/14/13	140,848		440		22.0	20′	No record of water.
Miocene	3	32	12N	23W	2/ 6/18	5.098	1.300	268	68.0	18.0	20′	Production for Feb., 1918.
El Dora Oil Co.	1	32	12N	23W		34,757	10,463	174	52.0	21.0		Prod. Mar., 1916–Jan., 1917.
El Dora Oil Co.	2	32	12N	23W								No reports.
Total production Zone A						1,433,173	496,417					

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*Approximately.

†Not through oil sand.

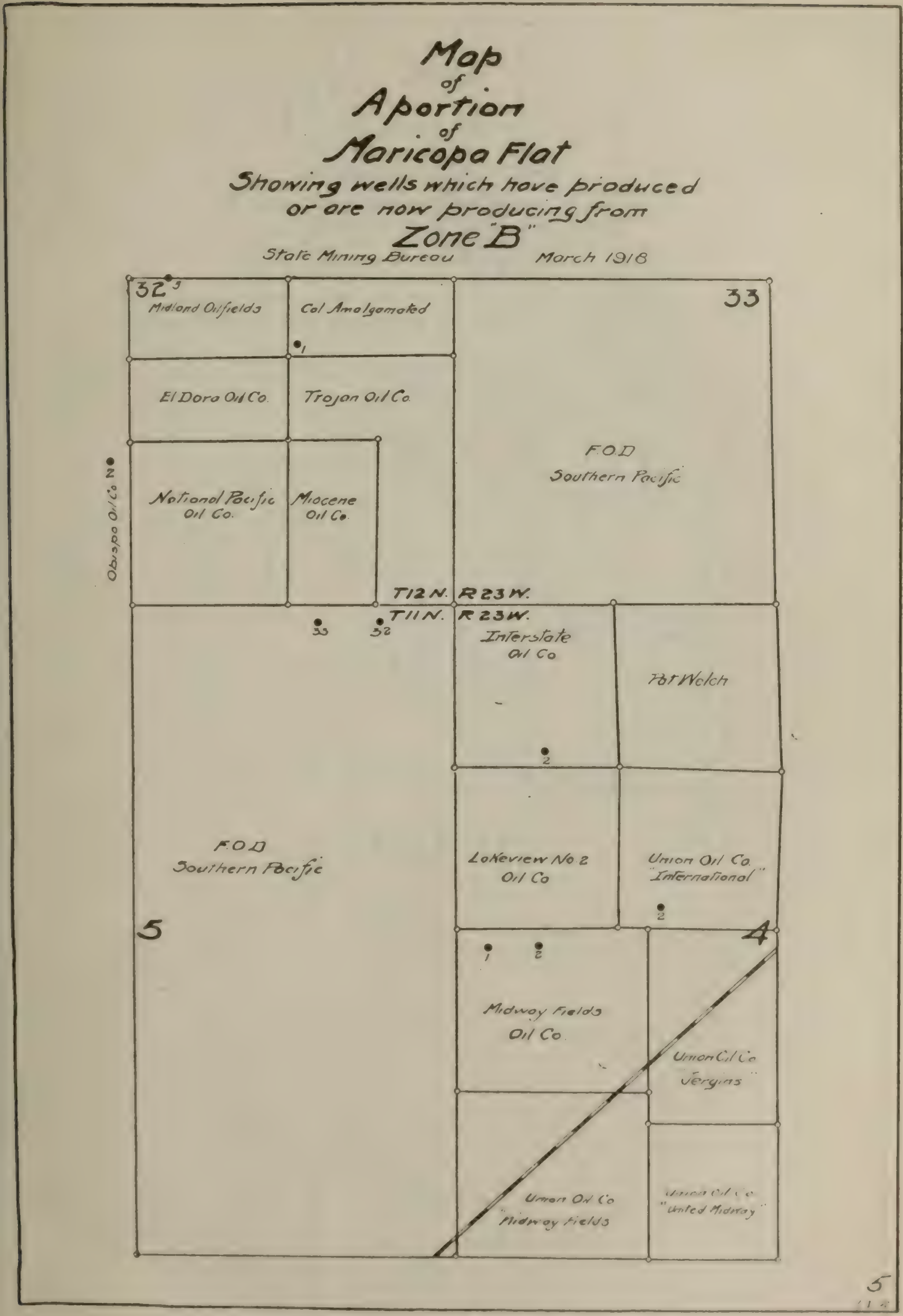

Map
of
A portion
of
Maricopa Flat
Showing wells which have produced
or are now producing from
Zone "B"
State Mining Bureau
March 1918
32
3
Midland Oilfields
Col Amalgamated
1
33
El Doro Oil Co.
Trojan Oil Co.
F.O.D
Southern Pacific
Obispo Oil Co N
National Pacific
Oil Co.
Miocene
Oil Co.
T12N. R23W.
T11N. R23W.
33
32
Interstate
Oil Co
Pat Welch
2
F.O.D
Southern Pacific
Lakeview No 2
Oil Co
Union Oil Co.
"International"
2
5
4
1
2
Midway Fields
Oil Co
Union Oil Co
"Jergins"
Union Oil Co
"Midway Fields"
Union Oil Co
"United Midway"
5

FIG. 18.

TABULATION OF PRODUCTION FIGURES FOR ZONE "B."

Production to February 1, 1918, in bbls.

Company	Well No.	Section	Township	Range	Date completed	Total oil	Total water	Average per producing day		Average gravity	Thickness of oil sand	Remarks
								Oil	Water			
Interstate Oil	2	4	11N	23W	1/23/13	856,322	66,685	520	40.0	24.0	8′	Report for Sept., 1913, missing.
Union "International"	2	4	11N	23W	2/14			50	?		15′	See history.
Midway Fields	1	4	11N	23W		90,000					13′	See history; production from "A" and "B."
Midway Fields	2	4	11N	23W							*	No report.
Southern Pacific	32	5	11N	23W	1/ 9/13	144,893	143,632	178	176	24.6	6′	
Southern Pacific	23	5	11N	23W	5/12/13	112,839	13,456	135	16	25.4	5′	
California Amalgamated	1	32	12N	23W								No reports.
Obispo Oil	2	32	12N	23W	10/19/12	22,796	229	153	1.5	25.9	*	Production Nov., 1915, to Mar., 1916; Jan., 1916, missing.
Midland Oilfields	3	32	12N	23W	7/26/12						12′	Bailed to test, April 14, 1912; mostly all water.
Total production of above wells from Zone B						1,226,850	224,002					

*Not through oil sand.

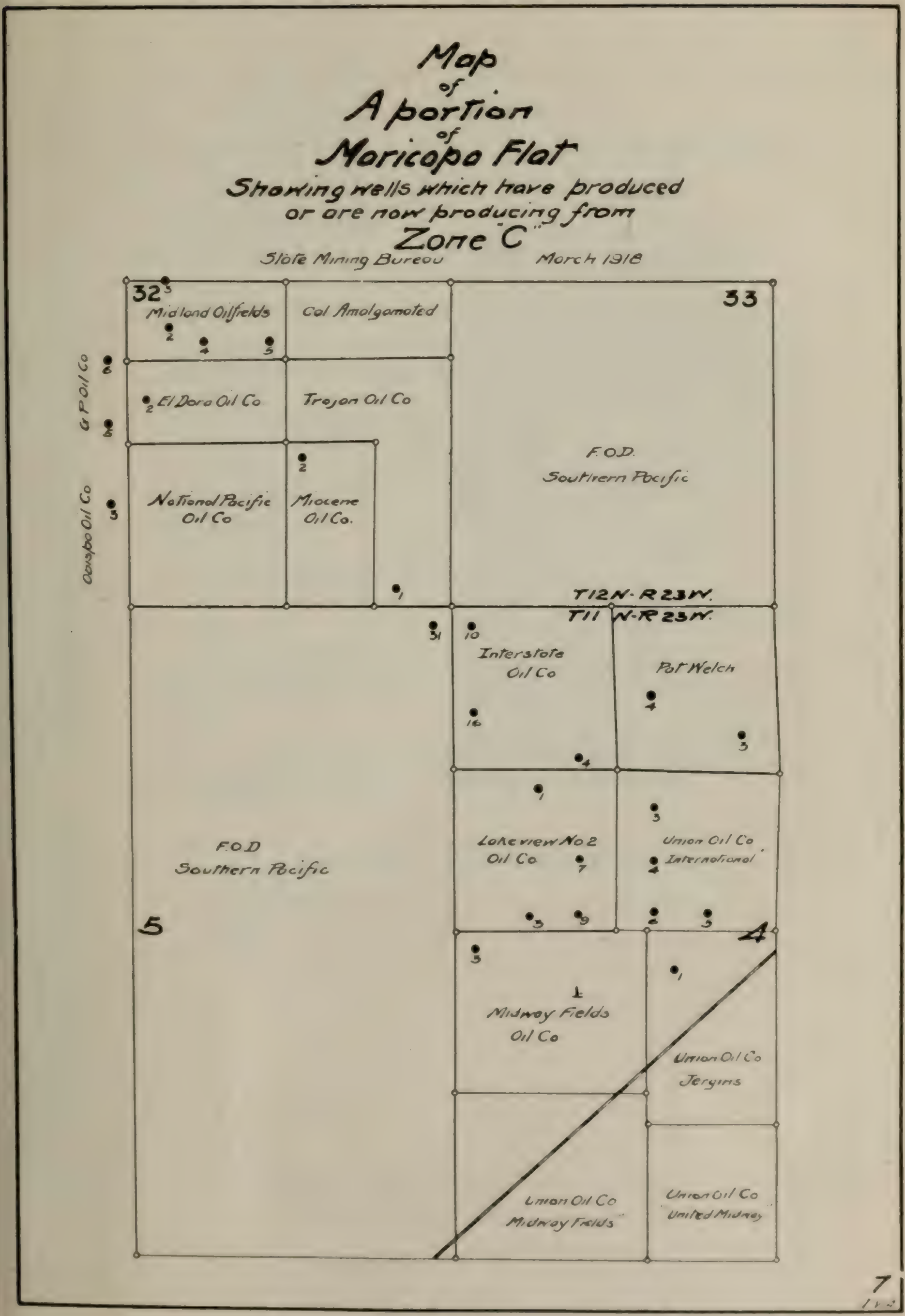

Map of A portion of Maricopa Flat
Showing wells which have produced or are now producing from Zone "C"
State Mining Bureau
March 1918
32
33
5
4
7
T12N-R23W.
T11 N-R23W.
Midland Oilfields
Col Amalgamated
G P Oil Co
El Dora Oil Co
Trojan Oil Co
Obispo Oil Co
National Pacific Oil Co
Miocene Oil Co.
F.O.D. Southern Pacific
Interstate Oil Co
Pat Welch
F.O.D Southern Pacific
Lakeview No 2 Oil Co
Union Oil Co International
Midway Fields Oil Co
Union Oil Co Jergins
Union Oil Co Midway Fields
Union Oil Co United Midway

FIG. 19.

TABULATION OF PRODUCTION FIGURES FOR ZONE "C."

Production to February 1, 1918, in bbls.

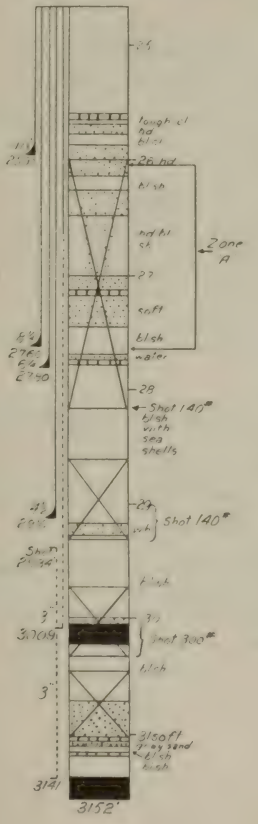
Company	Well No.	Section	Township	Range	Date completed	Total oil	Total water	Average per producing day		Average gravity	Thickness of oil sand	Remarks
								Oil	Water			
Interstate	4	4	11N	23W	6/16	488,552	519	793	0.9	27.0	86′	
Interstate	10	4	11N	23W	7/ 5/17	172,753	120	835	0.6	27.0	17′	
Interstate	16	4	11N	23W	1/22/18	1,000	0	200	0	27.0	10′	New well.
Lakeview No. 2	1	4	11N	23W	5/10/14	†5,175,000	‡	30,000	------	25.0	*	
Lakeview No. 2	3	4	11N	23W	----------	200	0	------	------	------	38′	
Lakeview No. 2	7	4	11N	23W	11/22/16	89,828	7,498	210	17.0	27.0	6′	
Lakeview No. 2	9	4	11N	23W	11/30/17	100	150	5	7.5	27.0	28′	
Pat Welch	3	4	11N	23W	----------	500	25,000	------	------	------	------	
Pat Welch	4	4	11N	23W	8/ 1/17	233,657	43,502	1,743	325.0	25.3	14′	
Union "International"	3	4	11N	23W	9/25/15	986,339	204,417	1,230	255.0	24.4	8′	Production since Nov., 1915.
Union "International"	4	4	11N	23W	6/24/16	752,457	64,060	1,370	117.0	25.0	*	
Union "International"	5	4	11N	23W	4/21/17	465,116	71,452	1,723	276.0	24.5	*	
Union "International"	6	4	11N	23W	12/16/17	8,469	4,111	197	95.0	23.8	16′	
Midway Fields	3	4	11N	23W	2/14	----------	----------	700	0.0	------	------	See history.
Union "Jergins"	1	4	11N	23W	4/28/15	8,763	2,777	11	3.4	17.5	8′	
Southern Pacific	31	5	11N	23W	8/10/17	14,534	170	121	1.4	26.4	15′	
Midland Oilfields	2	32	12N	23W	5/10/15	87,308	48,395	104	57.5	18.9	13′	Production since Oct., 1915.
Midland Oilfields	3	32	12N	23W	1/ 3/14	5,037	80,527	12	200.0	23.9	18′	Production since Oct., 1915.
Midland Oilfields	4	32	12N	23W	7/12/14	795,039	139,802	1,041	183.0	21.9	35′	Production since Oct., 1915.
Midland Oilfields	5	32	12N	23W	4/ 7/15	6,527	54,634	17	150.0	23.1	71′	Production since Oct., 1915.
General Petroleum	5	32	12N	23W	7/24/12	121,166	880	147	1.1	25.4	18′	Production since Oct., 1915.
General Petroleum	6	32	12N	23W	4/24/13	264,556	1,161	321	1.4	26.3	4′	Production since Oct., 1915.
Obispo	3	32	12N	23W	12/22/13	44,488	4,616	294	30.6	25.7	8′	Production from Nov., 1915, to Mar., 1916, less Jan., 1916.
Miocene	2	32	12N	23W	4/28/14	2,001,492	455,174	1,566	343.0	26.0	15′	
Trojan	1	32	12N	23W	3/15	452,669	0	675	0	26.7	22′	Production from Mar., 1916; Jan., 1918, missing.
El Dora	2	32	12N	23W	3/ 1/18	----------	----------	200	0	------	30′	Well deepened.
Total production of above wells from Zone C	------	------	------	------	----------	2,175,550	1,211,995					

*Not through oil sand. †Estimated. ‡No record.

ABSTRACT OF HISTORY OF PORTION OF

UNION OIL CO. (International) #2 4"/23

WITH COMMENTS



10" Casing cemented at 2595' with 180 sacks. Set 15 days. Drilled to 2611' - bailed hole and water broke in.

Drilled from 2611' to 2695 with Standard tools, water not shut off, and from 2695' to 2760' with rotary. Cemented 8¼" at 2760' with 120 sacks. (This was below point where top oil sand might be expected). Drilled to 2765' bailed to 1800 stood 4 hours without showing water.

Drilled to 2780' and cemented 6¼" at that depth with 50 sacks. (History gives no reason but it probably was to cement off upper flowing water)

Drilled to 2780', bailed 600' - water broke in.

Drilled to 2842' with cable tools and to 2925' with rotary and cemented 4½" on a bridge at 2910' with 55 sacks.

Drilled to 2915', bailed to 2000' and drilled to 2945' with water at 2000.

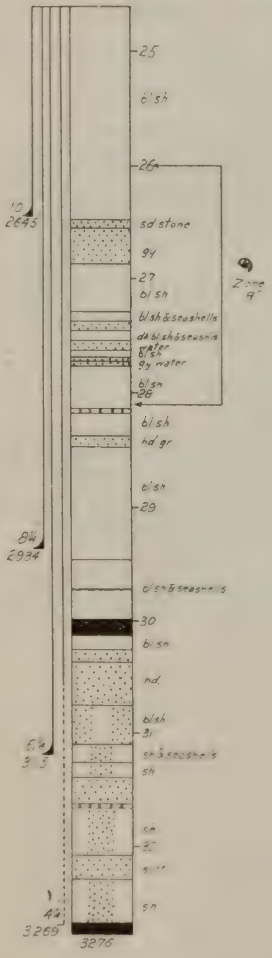
Carried 3" to 3019', encountering oil at 3004'. Tested this. Produced 10 bbl. daily (This is the Tar Sand of Zone "B").

9

FIG. 20.

ABSTRACT OF HISTORY OF PORTION OF

UNION OIL CO. (International) #3 4 11/23



WITH COMMENTS

Drilled with rotary to 2666'. bridged back to 2645' - cemented 10" at 2645' with 200 sacks. Drilled to 2666' could not bail water.

Drilled ahead with cable tools to 2934', carry 8¼" with water not shut off.

Cemented 8¼" at 2934' with 60 sacks.

Drilled to 2944' - bailed to 2000 found water shut off.

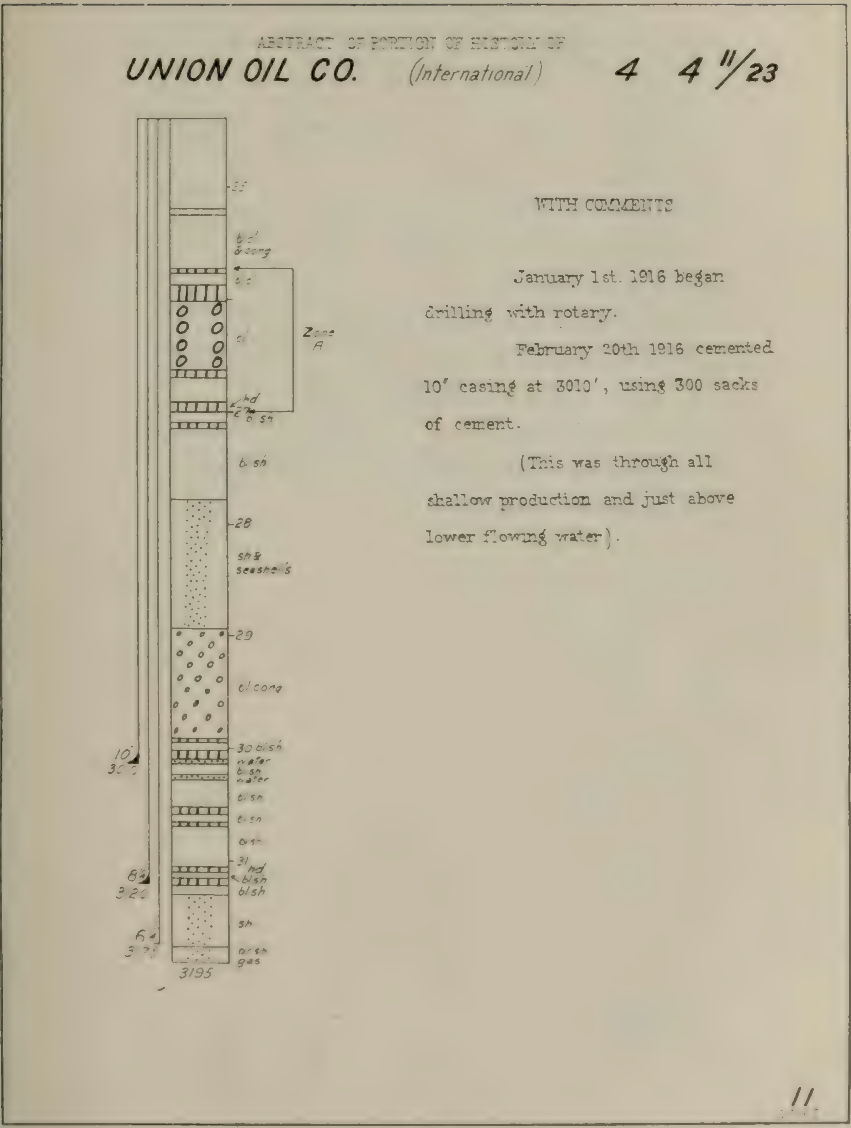
Drilled to 3015' with cable tools. tested showing at 3000'.

(This was the Tar Sand of Zone "B")

Carried 6¼" to 3028' encountering water sand. (Lower flowing water)

10

FIG. 21.



ABSTRACT OF PORTION OF HISTORY OF

UNION OIL CO. (International) 4 4 11/23

WITH COMMENTS

January 1st. 1916 began drilling with rotary.

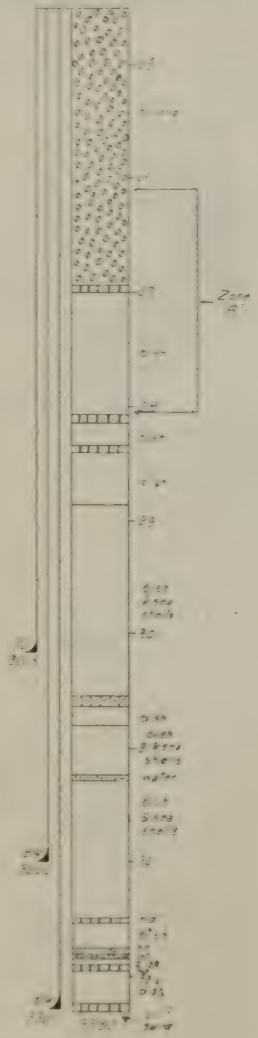
February 20th 1916 cemented 10″ casing at 3010′, using 300 sacks of cement.

(This was through all shallow production and just above lower flowing water).

FIG. 22.

ABSTRACT OF HISTORY OF PORTION OF

UNION OIL CO. (International) #5 4 11/23



WITH COMMENTS.

August 22nd 1916 began drilling

October 14th 1916, cemented 10' casing at 3015', using 400 sacks.

This is through all shallow productive sands.

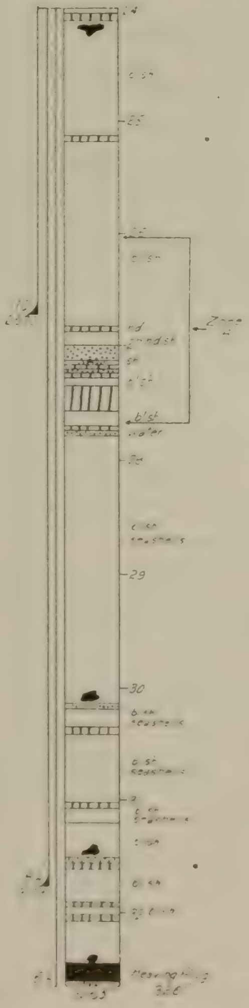
At 3055 Tar sand of Zone 'B' was encountered.

12

FIG. 23.

ABSTRACT OF HISTORY OF PORTION OF

UNION OIL CO. (International) #6 4 11/23



Cemented 10" Casing at 2670' with about 100 sacks.

Shut-off tested, water could not be bailed below 700'.

Attempted to re-cement without success.

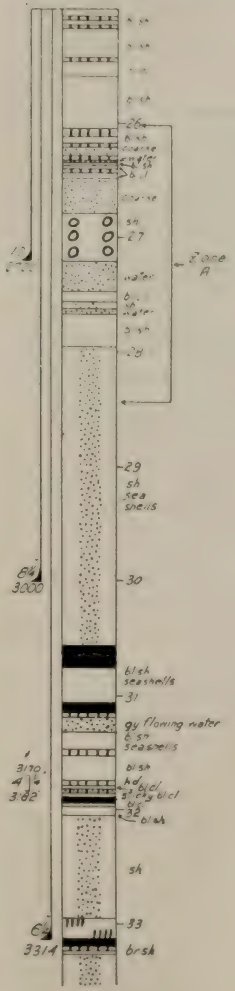
Mudded sands as encountered to a depth of 3175' and cemented 8¼" at that depth, with 135 sacks.

13

FIG. 24.

HISTORY OF PORTION OF

UNION OIL CO. (Jergins) #1 4 11/23



WITH COMMENTS.

"Started well with rotary March 23, 1913 When well was 1715', we lost circulation and had to put in 300 of 17" S.P. to shut off caving sand; Took twelve days to get circulation back. On July 4, 1913 the rotary pipe stood fifteen minutes and it froze and could not get it loose. Got string of 5' left hand pipe and had all pipe fished out November 4th 1913.

December 12, 1913 cemented 2720' 10"-40# casing, using 200 sacks Cowboy cement.

January 25, 1914 cleaned out cement and drilled to 3000'.

March 8, 1914 cemented 3000' 8¼" - 36" casing, using 125 sacks of Cowboy cement."

(This was below Zone 'A')

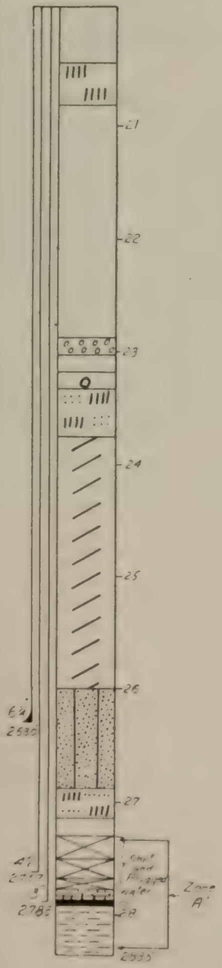
14
MHS

FIG. 25.

ABSTRACT OF HISTORY OF PORTION OF

UNION OIL CO. (International) #1 4· 11/23

WITH COMMENTS.



Taken over from Coronation by Union Oil Co. at a depth of 2835′ with 4½″ oil string to that depth. 6¼″ casing parted at 800′ and water in the hole. 9 joints tubing lost in hole.

Pulled 800′ of 6¼″, recovered 6 joints of tubing, shot 4½″ at 2740′ and pulled. Found shoe of 6¼″ at 2630′ Screwed 6¼″ together tight, – plugged hole, bailed 6¼″ to 500′ and water broke in, bringing oil with it.

Sidetracked old 4½″ to 2757′ and cemented new 4½″ at 2757′ with 30 sacks.

Drilled to 2768′, bailed to 1600′ showed oil and gas – no water.

Drilled to 2783′ and could not bail water below 400′.

Drilled to 2795′ and swabed. Well flowed oil and water; about 75 bbl. oil and 150 bbl. water for several months.

Later blown with air, producing about 75 bbl. of oil.

This production came from Zone "A" The water probably came from the white sand above Zone "A"

15

FIG. 26.

TABULATION SHOWING THICKNESS AND

Company	Well No.	Section	Township	Range	Lowest top water sand			Formations from top water to first sand of Zone "A"	
					Thick	Water level below surface	Volume	Thick	Nature
Miocene Oil	1	32	12	23	8	--------	--------	31	7′ shell, 21′ blue shale, 4′ black shale.
Miocene Oil	2	32	12	23	5	--------	--------	40	Sticky blue clay, black shale, brittle shale.
Miocene Oil	3	32	12	23	5	--------	--------	37	Sticky blue clay, blue shale.
Trojan Oil	2	32	12	23	10	--------	--------	49	Sticky blue shale, shell
P. Welch Oil	2	4	11	23	8	173	Not given	31	Sticky blue clay, blue shale.
S. P. Co. (F. O. D.)	33	5	11	23	5	--------	--------	150	Blue shale, 3′ shells, brown shale.
Lakeview No. 2 Oil	3	4	11	23	----	--------	--------	----	--------------------
Lakeview No. 2 Oil	7	4	11	23	----	--------	--------	----	--------------------
Lakeview No. 2 Oil	13	4	11	23	5	--------	--------	----	Black shale, hard blue shale.
Midway Fields Oil	1	4	11	23	----	--------	--------	----	--------------------

NATURE OF FORMATIONS IN WELLS.

Zone "A"		Formations between Zone "A" and upper flowing water		Upper flowing water			
Thick	Nature	Thick	Nature	Thick	Water level	Volume	Nature
63	White sand carrying oil, blue shale, shell, black shale, oil sand.	----	----	----	----	----	
30	Oil sand, shale, oil sand	47	Blue shale ----	3	----	----	Water sand, carries some oil and gas.
40	Oil sands with shale between.	----	----	----	----	----	
44	Oil sands with shale between.	----	----	----	----	----	
25	Oil sand, blue shale and sea shells.	----	----	----	----	----	
5	Sand, first logged as water and later as oil.	37	Blue shale, shell	8	Flows	Flows over casing	Sand.
7	3′ blue shale, shows oil; 4′ oil sand.	27	25′ blue shale, 2′ shell.	8	----	----	Gray water sand.
6	Oil sand ----	50	46′ dark shale, 4′ shell.	3	----	----	Sand.
10	2′ sandy oil shale, 8′ hard oil sand.	----	----	----	----	----	
19	Oil sands with shale between.	37	33′ blue shale, 4′ shell.	----	Flows	Flows	Bluish white sand.

CASING USED IN WELLS IN WHICH IT WAS

Section	Township	Range	Company	Wells definitely locating Zone "A" before drilling to Zone "C"						
				Casing in feet						
				Well No.	15½"	10"	8¼"	6¼"	4½"	3"
4	11	23	Union Oil (Intern't'l)	------	--------	--------	--------	--------	--------	--------
4	11	23	Union Oil (Intern't'l)	------	--------	--------	--------	--------	--------	--------
4	11	23	Union Oil (Intern't'l)	------	--------	--------	--------	--------	--------	--------
4	11	23	Union Oil (Intern't'l)	------	--------	--------	--------	--------	--------	--------
4	11	23	Union Oil (Intern't'l)	------	--------	--------	--------	--------	--------	--------
4	11	23	Union Oil (Jergins)	------	--------	--------	--------	--------	--------	--------
4	11	23	Lakeview No. 2 Oil	3	--------	2,527	2,578	3,021	3,081	3,258
4	11	23	Lakeview No. 2 Oil	7	120	2,564	2,605	2,964	3,000	--------
4	11	23	Lakeview No. 2 Oil	9	120	2,585	2,629	3,005	3,291	--------
4	11	23	Interstate Oil	16	95	2,408	2,832	2,963	--------	--------
4	11	23	Interstate Oil	------	--------	--------	--------	--------	--------	--------
4	11	23	Pat Welch	------	--------	--------	--------	--------	--------	--------
4	11	23	Pat Welch	------	--------	--------	--------	--------	--------	--------
4	11	23	Midway Fields Oil	3	--------	2,600	2,749	2,752	3,185	--------
5	11	23	S. P. Co. (F. O. D.)	------	--------	--------	--------	--------	--------	--------
Total casing, in feet					335	12,684	13,393	14,705	12,557	3,258
Cost per foot					$6.08	$3.05	$2.20	$1.70	$1.16	$0.52
Cost by sizes					$2,037	$38,686	$29,465	$24,999	$14,566	$1,694

Total casing cost	$111,447
Average casing cost per well	22,289

ATTEMPTED TO PRODUCE FROM ZONE "C."

Wells not definitely locating Zone "A" before drilling to Zone "C"

	Casing in feet							
Well No.	17½" S. P.	15½"	11⅝"	10"	8¼"	6¼"	4½"	3"
2	112			2,595	2.760	2,780	2.910	3,147
3				2,645	2.934	3,115	3,269	
4				3,010	3,120	3,175		
5				3,015	3,200	3.327		
6				2,670	3.175	3.265		
1	330			2.720	3,000	3.314	437	
1		185		2.225	2,680	3,005		
4					2,526	3,011	3,387	
10		117		2.604	2,948	2.977	3.131	
3		310		2.979	3,367	3.900		
4		530		2.908	3,234	3.409		
31	(20-18) 277		2,545		2,850	3,073		
	719	1,142	2,545	27,371	35,794	38 351	13,131	3,147
	$7.50	$6.08	$3.06	$3.05	$2.20	$1.70	$1.16	$0.52
	$5,393	$6 943	$7,788	$83,481	$78,747	$65,197	$15,235	$1,636

Total casing cost	$264,420.00
Average casing cost per well	22,035.00

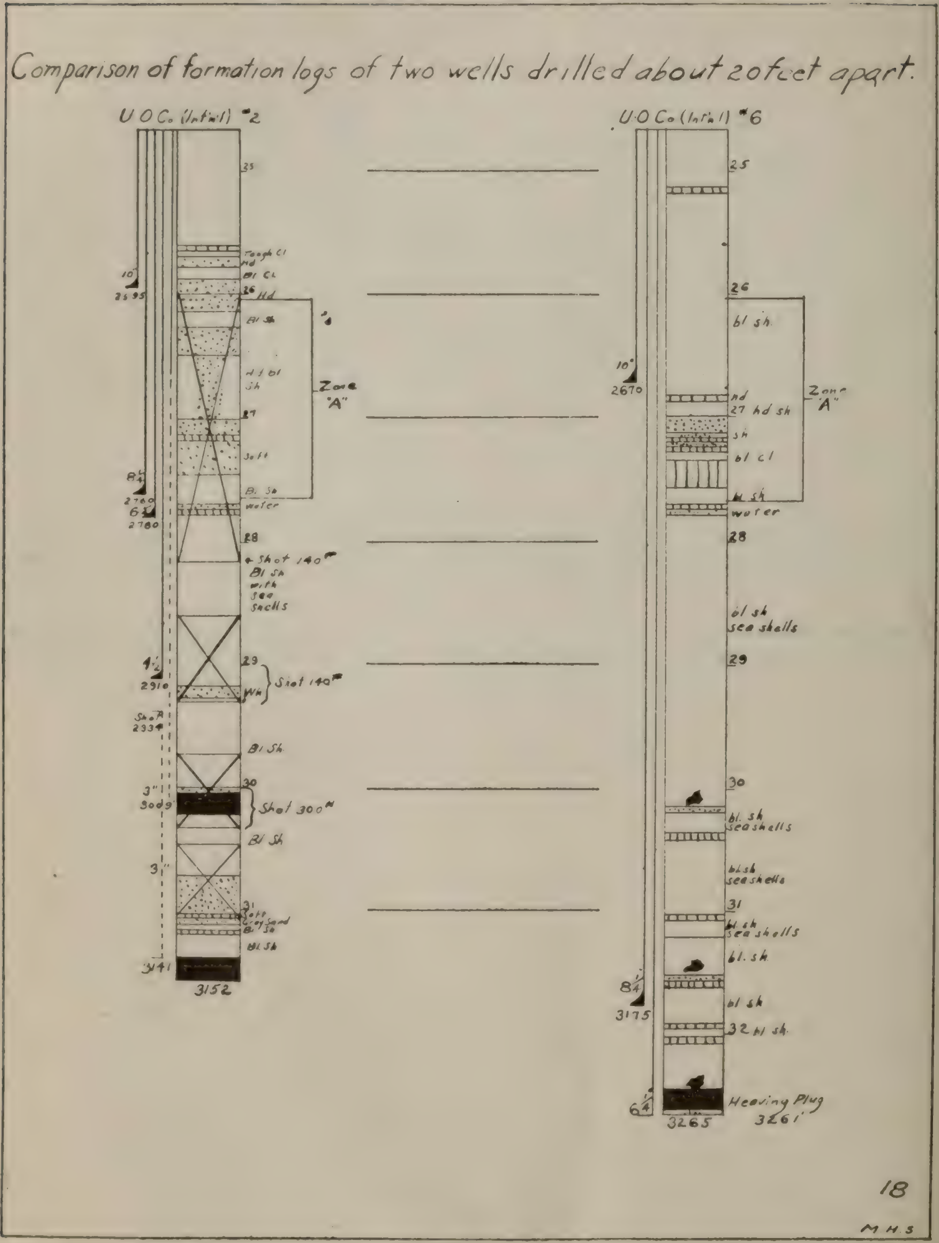

Comparison of formation logs of two wells drilled about 20 feet apart.
U O Co. (Int'nl) #2
25
Tough Cl
Hd
Bl Cl
26 Hd
10"
2595
Bl Sh
Hd & bl Sh
Zone "A"
27
Soft
Bl. Sh
8¼"
2760
6⅝"
2780
water
28
Shot 140 qt
Bl Sh with sea shells
29
4½"
2910
Wh
Shot 140 qt
Shoe
2934
Bl Sh
30
3"
3069'
Shot 300 qt
Bl Sh
3"
31
Soft Grey Sand
Bl Sh
Bl Sh
3141
3152
U·O Co (Int'nl) #6
25
26
bl sh
10"
2670
hd
27 hd sh
sh
bl cl
bl sh
Zone "A"
water
28
bl sh sea shells
29
30
bl. sh sea shells
bl sh sea shells
31
bl sh sea shells
bl. sh
8¼"
3175
bl sh
32 bl sh
6¼"
Heaving Plug 3261'
3265
18
M H S

FIG. 27.

The following operations are cited in the sixth paragraph, Order No. 5, page 414, as illustrating the difficulty of protecting Zone A with mud and cement seal when upper water is not shut off:

Pat Welch Well No. 4, Sec. 4, T. 11 N., R. 23 W., S. B. B. & M.

March 6, 1917—10″ casing cemented at 2904′ with 400 sacks cement. The cement apparently satisfactorily placed. 10″ casing tested, and water found not shut off.

April 12, 1917—Pumped about 10 sacks of cement into formation at shoe of 10″ casing, under 600 lbs. per square inch pressure.

April 20, 1917—Tested, and found water not shut off.

May 7, 1917—Ripped hole in 10″ casing at a depth of 2824′ and bailed to 1200′, and on May 8, 1917, found water at original level and 100′ of fine sand in the hole.

May 12, 1917—Pumped cement into rip after pumping about 500 bbls. of mud into formation through the rip. Final pressure 600 lbs. per square inch. Ripped hole in 10″ casing at 2798′ (opposite supposed upper oil sand. Attempted to pump water out through rip at 2798′ but failed. Assumed that cement had protected top sand and proceeded to drill well into Zone "C."

The next larger string of casing in this well was landed at a depth of 530′ and the only other methods that might have been followed to insure protection to the top sand, would have involved either drilling out through the 10″ casing with 8″ casing above the upper sands, or re-drilling with 10″ casing from a depth of about 530′.

Southern Pacific Company (Fuel Oil Dept.) Well No. 31, Sec. 5. T. 11 N., R. 23 W.

March 24, 1917—Cemented 11⅝″ casing at a depth of 2545′ with 7 tons. Cementing approved as satisfactory. When tested, water found not shut off.

June 30, 1917—Ripped holes in 11⅝″ casing at 2505′, 2510′ and 2530′, but could not pump water through these rips. Assumed that upper sands were sealed and protected by the cement, and proceeded to drill well to zone "C."

The next larger string of casing in this well was landed at a depth of 190′. As in the preceding case, the only other method which might have been used to insure protection to the upper sands, would have involved either re-drilling the hole with the same size casing from a depth of approximately 190′ or reducing the size of the hole to 9⅝″ by drilling out through the 11⅝″ casing, above the point where the top oil sand was encountered.

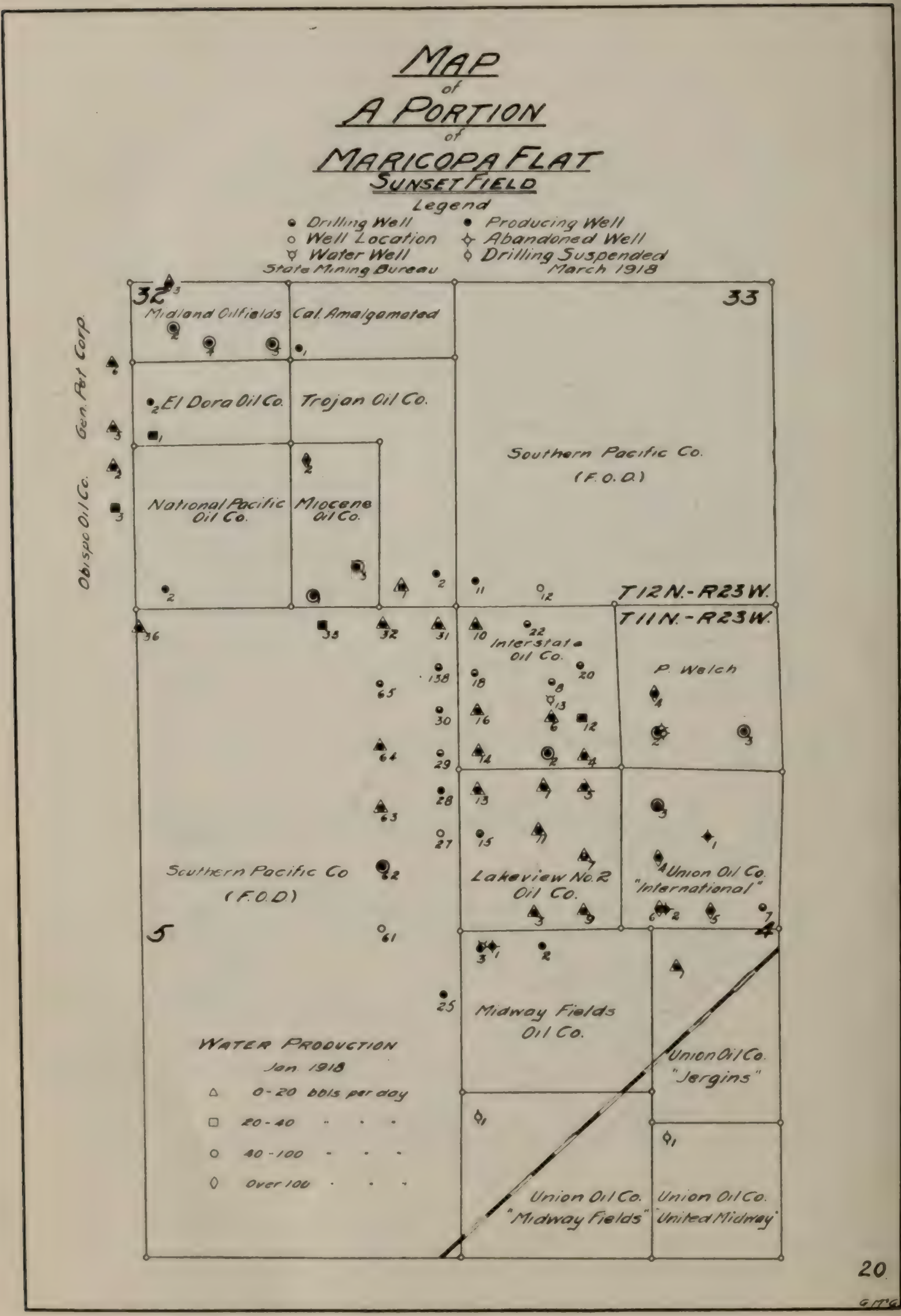

MAP
of
A PORTION
of
MARICOPA FLAT
SUNSET FIELD
Legend
● Drilling Well
○ Well Location
Water Well
● Producing Well
Abandoned Well
Drilling Suspended
State Mining Bureau
March 1918
32
33
Midland Oilfields
Cal. Amalgamated
Gen. Pet. Corp.
El Dora Oil Co.
Trojan Oil Co.
Southern Pacific Co.
(F.O.D.)
Obispo Oil Co.
National Pacific Oil Co.
Miocene Oil Co.
T12N.-R23W.
T11N.-R23W.
Interstate Oil Co.
P. Welch
Southern Pacific Co
(F.O.D.)
Lakeview No. 2 Oil Co.
Union Oil Co.
"International"
5
4
Midway Fields Oil Co.
Union Oil Co.
"Jergins"
WATER PRODUCTION
Jan. 1918
△ 0-20 bbls per day
□ 20-40
○ 40-100
◊ Over 100
Union Oil Co.
"Midway Fields"
Union Oil Co.
"United Midway"
20

FIG. 28.

ORDER BY DISTRICT OIL AND GAS COMMISSIONERS.

May 4, 1918.

In the Matter of the Appeal of the Union Oil Co. to the Oil and Gas Commissioners of the State of California.

At a meeting held in Taft, California, on April 9, 1918, in reference to the proper completion of Well No. 7 on Section 4/11/23, owned by the Union Oil Co. of California, at which meeting the Oil and Gas Commissioners of the Fourth District of the State of California were invited to attend for the purpose of hearing the evidence given by the California State Mining Bureau, which was represented by R. P. McLaughlin, Supervisor, and his deputies from the various districts of the State of California.

Also evidence given by the Union Oil Co. of California which was represented by G. Kamerer, superintendent in this District and various employees, also evidence given by the Lake View No. 2 and Interstate Oil Companies, of this District, which was represented by Mr. Roy Evans, their superintendent and various employees; also evidence given by the Pat Welch Oil Co. of this District, which was represented by Mr. R. R. Pollack, its superintendent.

On the twenty-seventh day of April a hearing was held on appeal to the Oil and Gas Commissioners and said appeal having been taken by the Union Oil Co. from the order made after the hearing on the ninth day of April, 1918, by R. P. McLaughlin, Supervisor of the California State Mining Bureau, and we, the Commissioners to whom said appeal was taken, hereby make the following findings and order in said matter.

1. That the above companies now own and are operating wells located in the northeast quarter of Section 4/11/23.

2. Also to witnesses not directly connected with the above companies.

3. After hearing the evidence and the explanations of the Peg model by Mr. R. N. Ferguson, Deputy Supervisor of this District, in connection with the different methods of drilling by the different companies, also to the method of cementing and mudding off water and oil sands, which in certain depths, lie in close proximity, from the difficulty these different oil companies encountered in drilling wells in this locality.

4. Also, takng into consideration the gravity of the situation as regards making recommendations for the drilling of wells in this or any other locality, to protect all oil sands from the infiltration of water, which, is very essential to the producing of oil in this immediate locality or in any other locality.

5. From the evidence given by the different witnesses, they have adopted, what we would consider, a very good plan of mudding and cementing all oil or water sands encountered or which might be encountered.

6. From the evidence given by the different witnesses during this hearing, on quite a number of occasions, there has been oil sands encountered and either pumped dry or became infiltrated with water. These wells have been deepened by permission from the State Mining Bureau of California, to proceed to a deeper sand which underlies the first oil sand.

7. From the description of the sands by the State Mining Bureau of California, these sands are described as Zone A or first oil sand, Zone B or second oil sand and Zone C or third oil sand.

8. The Lake View No. 2 and Interstate Oil Companies have had some very productive wells from the first zone or first oil sand.

9. From the evidence of the various witnesses, directly under the first oil sand, is what they call a flowing water, which, if encountered and not shut off, would practically ruin the first oil zone.

10. From the evidence taken at this hearing, there was a meeting called some time ago in the S. P. Company's (Fuel Oil Dept.) Office at Kerto, by the different oil companies located in the N.E. ¼ of Section 4/11/23. At this meeting, there was also a representative of the California State Mining Bureau.

11. They took up the matter of the best method to pursue after deepening wells from the first oil zone to a deeper zone. They finally decided that they could land another string of casing about 400 or 450 feet below the first oil zone and force enough cement behind this casing to extend through the upper oil zone. Also, through the flowing water encountered directly below this oil zone, sealing off all oil and water encountered above the lower casing shoe which would be approximately 400 feet.

12. From the evidence taken at this hearing it would appear that it was necessary to have a string of casing landed in close proximity to Zone A or first oil sand to tie to when making the next cement job. After commissioners have deliberated on the evidence for some time it was decided that a string of casing landed in close proximity to Zone A or first oil sand was a very good idea but on the other hand did not deem it necessary to make a good cement job and decided they would rather have enough room between the first oil zone and casing landed above first oil zone to pump enough cement to cover any oil sands below casing shoe to protect sands from infiltration of water but not have cement to come in contact with casing above Zone A or first oil sand.

13. From the evidence given at this hearing it was very clearly defined that this process which they had adopted, of cementing, had proven very effective due to the tests of oil made for water produced from the various wells before and after these various wells were drilled to a lower zone.

14. From the evidence given at this hearing by the different witnesses, the water infiltration into Zone A oil sand from any water encountered while drilling below Zone A or first oil sand, was really nothing more than could be expected from the oil produced in the period of time which intervened between the time the first oil sand was encountered and the drilling and producing oil from Zones B or C. Therefore, we think, that the amount of cement these wells were cemented with had effected a very good seal to any and all water encountered below the first oil sand. Also, it must be remembered that the wells that were drilled to a lower depth, either Zone B or C, were not being produced from Zone A.

15. The International Oil Company of California have drilled several wells on their parcel of land in the N.E. ¼ of Section 4/11/23, and from the evidence given at this hearing, the Union Oil Company of California had purchased this land on the strength of a well drilled on this parcel of land, known as Coronation No. 1.

16. At the time this purchase was made, this well was flowing some oil and water. The Union Oil Company started their development work shortly after purchasing this property, and from the evidence given at this hearing, expended in the neighborhood of $214,000.00 trying to locate Zone A or the first oil sand, which the Interstate and Lake View No. 2 and Pat Welch Oil Companies were producing from. After repeated effort to locate this sand, they finally decided to abandon the idea of ever locating an oil sand known as Zone A. And, from the recommendations by them to the California State Mining Bureau, they were allowed to proceed to deepen these wells to a depth sufficient to satisfy them whether there was a lower Zone or Zones, which, they afterward discovered to be known as Zone B and C in that locality. Several wells were drilled which proved very productive.

17. From the evidence given at this hearing, the Union Oil Company, before landing what they called a water string at a depth of approximately 3000 feet, did mud up and pump in enough cement behind this string of casing to seal off all water and oil if any were encountered, far enough back above Zone A to protect oil sands operated and produced by any other companies on the N.E. ¼ of Section 4/11/23.

18. From the evidence given at this hearing, it would appear to us that this has been very effectually done, due to the small increase of water from the first oil zone or zones during a period of several years.

19. The Union Oil Company's Section 4/11/23 well No. 7 was drilled to a depth of 2840 feet with a 16″ rotary bit from top of hole to bottom. While this company was putting in their 10″ casing, this casing became tight at 2570 feet; so tight, that this casing could not be loosened after making repeated attempts. They afterward tried for

circulation behind this casing, which they got, and pumped in 150 sacks of cement. After leaving hole stand cemented for a certain length of time, they tested out this well for water.

20. After cleaning out this well through the shoe and testing for water, they found they could not lower water below the water level. They decided they had either encountered water below the casing after this well had been drilled 2840 feet, but casing was landed and cemented at 2570 feet, or water was coming around the 10-inch shoe.

21. The Union Oil Company requested permission from the California State Mining Bureau to proceed with this well to a depth of 3300 feet with 8¼-inch casing. Before casing was landed at 3300 feet, they were to pump enough cement behind this string of casing to come back far enough or to the bottom of the 10″ casing, which was landed at 2570 feet and to cement off all water sands that had been encountered below that depth. This request was refused by the State Mining Bureau. The Union Oil Co. then requested permission to land a string of 6¼-inch casing at 2840 feet, cementing same. After cement had set long enough, to guarantee its hardness, they were to make proper tests witnessed by the State Mining Bureau of California as to its virtue. After the State Mining Bureau had accepted same as dry, they were to proceed with the drilling of this well to a depth deep enough to determine it Zone A extended through the property or to this well. This proposal was also rejected by the State Mining Bureau.

22. We, as a body of Commissioners, who represent the Oil Industry of the Fourth District of the State of California thought that test referred to in paragraph 21, would have been a very good test to determine for all times whether Zone A extended to this property in paying quantities, as the Union Oil Company had endeavored for several years prior to this time to develop this Zone A or first oil sand.

23. After the Commissioners of the Fourth District of the State of California had heard the evidence given in reference to the drilling of wells which had been drilled and produced from Zone A or first oil sand, also had been drilled through Zone A and produced from the lower Zones and the proper methods had been pursued whereby the top Zone was protected from water by the mudding and cementing process, we, the Commissioners of the Fourth District of the State of California, have agreed that the drilling of Section 4/11/23 Well No. 7 on the N.E. ¼ of this section, should be drilled to a depth of 3300 feet, using 8¼-inch casing, and that enough cement should be pumped behind this string of 8¼-inch casing to reach to a height of not less than 2700 feet, and that after this cement has been pumped in the hole of a sufficient quantity, that cement is followed up with mud of a sufficient weight to

approximately counterbalance the weight of the cement so that after the casing is landed at 3300 feet, no cement could force its way back into the casing. This, we, the Commissioners of the Fourth District of the State of California, think would make a very practical and good cement job, to protect any and all oil sands, if such oil sands exist between the depth of 2570 feet where 10″ casing is landed and 2875 feet where oil sand, if any, might be encountered.

24. This well No. 7, at the present time, has a hole drilled to 2840 feet by a 16″ rotary bit, leaving a hole below the bottom of the 10″ casing, which is landed at 2570 feet, of 270 feet, which is 16″ in diameter. From this depth to a depth of 3300 feet this hole should be drilled with a 10″ rotary bit.

25. From the order issued from the Mining Bureau wherein they recommend the International Oil Company to develop this well from 2840 feet, after 6¼″ casing is cemented at that depth, they suggest the drilling of 15 feet at a time and testing for oil and water, and continuing this test by drilling 15 feet at a time, until oil or water is encountered. This is unsatisfactory.

26. After the commission had deliberated on this order for some time and the commissioners all being practical men they decided that this method would be impracticable and almost impossible to keep casing free and make these tests every 15 feet.

Therefore, we the commissioners of the Fourth District hereby order that the Union Oil Company, or International Oil Company, drill said hole to a depth of 3300 feet using 8¼″ casing and pump sufficient cement behind this string of 8¼″ casing to reach a height of not less than 2700 feet and that after this cement has been pumped in the hole that they follow up with mud of sufficient weight to counterbalance the weight of the cement so that after the casing is landed at 3300 feet no cement could force its way into the casing. This method was testified to by Mr. Evans of the Lake View No. 2 Oil Company and Mr. Pollack of the Pat Welch Oil Company, to be practical and very satisfactory.

It is further ordered that the Union Oil Company shall mud off all sands as encountered under pressure of 400 pounds per square inch at the surface, or to such times as the sands shall take no more mud, to a depth of 3300 feet or at the point casing is to be landed.

It is also ordered that at the time the cementing is to be done, that the Union Oil Company notify the Deputy Supervisor so that a representative of the State Mining Bureau and a representative of the Oil and Gas Commissioners of the State of California, be present and that in the event of any mechanical failure during the pumping of this mud and cement, whereby a sufficient amount of cement can not be pumped behind this casing to seal off all the sands encountered below the depth of 2570 feet, the matter to be taken up immediately with the oil and gas commission for its consideration.

Dated this 4th day of May, 1918.

E. J. Schneider,
C. E. Ballagh,
J. B. Newton,
Percy A. Williams,
D. T. Saine,
Board of Commissioners.

Note.—January 1, 1919. Three months after completion of the well, in a manner disapproved by the engineering staff of the State Mining Bureau, it is producing considerable water and has actually depreciated the value of the entire property. The total production of the property during three months prior to completion of the well was 136,840 bbl. of oil, while during an equal period of time since its completion the total oil production has only been 112,684 bbl.

SUNSET FIELD.

The extent of this field has been somewhat enlarged by the development of production by the Standard Oil Company on Section 7, T. 11 N., R. 23 W., S. B. B. & M., and the Midway Oil Company on Section 35, T. 12 N., R. 24 W., S. B. B. & M.

Peg models on a scale of 100′ to the inch, both vertical and horizontal, have been constructed covering a portion of the Maricopa Flat and as a result the information on this area is much more exact than it was previously.

A contour map of the first oil sand of Zone A has been prepared and has proved invaluable in determining the proper point of shut-off in new wells.

The composite log (p. 424), made up by combining some typical logs graphically, has been used with excellent results in predicting the depths of the various sands below the top of the first oil zone.

BELRIDGE FIELD.

Careful operations in this field by the General Petroleum Corporation and the Marina Oil Company have successfully overcome a very difficult water situation and have developed a good production from shallow depth. The method used by these companies of thoroughly testing the formations penetrated, as the hole is drilled, are worthy of emulation by many other operators. In this testing much use is made of a temporary shut-off above the sand to be tested.

KERN RIVER FIELD.

The year has not been marked by any great improvement in water conditions in the field.

Several companies in the vicinity of the old West Shore property in Section 32, T. 28 S., R. 28 E., M. D. B. & M., have by mutual agreement persistently sought for an offending well in the hope that by plugging it their water troubles would be eliminated. At the end of the year the work has not shown any results after several wells have been tested. Commendable as this spirit of co-operation is, it is believed that much time and money might have been saved by a thorough investigation of the early records as well as of the underground structure before the work was begun. Such an investigation is being made or has recently been completed by the geological department of the Standard Oil Company and there is little room for doubt that if the recommendations of the investigating engineers are followed the source of the water will soon be apparent.

The Associated Oil Company has begun an extensive engineering investigation that will undoubtedly yield big returns. To date no repair work complying with the recommendations of the engineer has been begun, but we are informed that such work is to commence shortly.

Investigations.

Investigations by this department have not reached completion during the year, but the following work is under way:

In Kern River field a cross section was made by the department along the line between the Associated (Kern) and the Peerless Oil Company properties showing line wells of both companies. Prints of the cross section were furnished both companies for their use in connection with a proposed campaign to shut off water.

A peg model of the N.W. ¼ of Section 31, T. 28 S., R. 28 E., M. D. B. & M., was constructed, but no further work has been done towards completing the investigation of that area.

A further investigation of conditions in the vicinity of the Amaurot and Del Rey Oil Companies property in Section 5, T. 29 S., R. 28 E., M. D. B. & M., was undertaken and brought nearly to completion, but work on it had to be suspended. In this investigation a peg model and complete cross sections were constructed, all based on a stadia survey of the property made by this department. An extensive study of the available records of the wells involved was also made and it is expected that it will be possible to issue a report by the first of the year.

MIDWAY FIELD.

On page 261, Bulletin No. 82, a proposed investigation of the Twenty-five Hill area was announced. Since that time a peg model has been constructed of Sections 25 and 26 and portions of 22, 23, and 24, T. 32 S., R. 23 E., M. D. B. & M., and a close study of all available records of all wells on Sections 25 and 26 has been made. A complete report on the last two sections will be issued as soon as possible.

Sections 25 and 26, T. 31 S., R. 22 E., M. D. B. & M.

The fact that operations were being carried on in this vicinity with no regard for uniformity in depth of shut-off has been recognized by this department for some time. The suggestions of the department as to establishing greater uniformity did not meet with universal favor and it was necessary to compile all available data to bring out the facts. Peg models have been completed of 1280 acres in this vicinity and the resulting information is such now that a great deal of assistance can be given the operators in the vicinity.

Requests for Investigations.

Requests have been made by owners and operators for investigations in the following cases:

Under date of January 7, 1918, a request was made by the following operators for an investigation of the water conditions in the vicinity of their properties in the McKittrick field.

Claude Pearson
J. H. Crafts
J. A. Pickle
Roy Fry
P. E. Bowles, Jr.

East Puente Oil Co.
Berry & Keller Oil Co.
Jewett Oil Co.
S. P. Co., Fuel Oil Dept.
Reward Oil Co.

A previous preliminary examination of the records of the area had shown that the records filed were insufficient for the purpose. To make this investigation it will first be necessary for the Department to go out and gather the necessary logs. It will also be necessary to make a property survey in order to get sufficiently accurate information from which to construct peg models and cross sections. Owing to the fact that a number of investigations having priority over this request have not yet been completed, this one has not yet been acted upon.

On May 9, 1918, the State Oil and Gas Supervisor instructed the deputy to start an investigation of the water conditions existing in Section 16, T. 32 S., R. 24 E., M. D. B. & M. A property survey was made of this section and some surrounding territory and a peg model was constructed. As a result of this work the department has been able to make a contour map of the first gas sand throughout a portion of the Buena Vista Hills which has shown some quite unexpected structure. The development of production from this gas sand in Midway Gas Company, Well No. 69, Section 15, T. 32 S., R. 24 E., M. D. B. & M., has led to the discussion of the advisability of shutting upper water off above this zone in all new wells.

A conference of operators was held at the office of the State Mining Bureau after the close of the year to consider the subject. At this conference it was decided that the deputy should outline the area within which it appeared advisable to make the shallow shut-off uniform. The investigation on which this is to be based is not yet completed.

On March 28, 1918, the State Oil and Gas Supervisor requested the various companies operating in the vicinity of Section 14, T. 32 S., R. 23 E., M. D. B. & M., to outline their knowledge as to the underground structure in that vicinity and to submit to him a statement as to their desires in the matter of protecting certain shallow oil sands in future drilling. We understand that the companies are co-operating in this investigation and that a report is to be submitted within a few months.

Complaints.

Under date of January 12, 1918, the Sunbeam Oil Company, operating in Section 52, T. 29 S., R. 21 E., M. D. B. & M., made complaint against the United Western Consolidated. Owing to the great amount of unfinished work before the department the investigation requested has not yet been undertaken.

On January 31, 1918, complaint was made by Howard M. Payne, Receiver for the Recovery Oil Company, Section 25, T. 31 S., R. 22 E., M. D. B. & M., against the Visalia Midway Oil Co., in the same section. The particular well complained of was No. 6. Peg models of the area in question have been constructed and the investigation has been begun.

DECISIONS.

NORTH LOST HILLS.

T. 25 S., R. 19 E., M.D.B. & M.

SECTION 2.

Crescent Petroleum Co.

Well No. 1, abandon. P 4-609.

Proposal to abandon received and later canceled because of company's change in plans.

Well No. 1, redrill. P 4-898.

Proposal to redrill approved with understanding that this department be informed as to developments.

Well No. 1, abandon. P 4-1308.

Proposal to abandon answered with complete specifications for carrying out the work.

Well No. 1, abandon. P 4-1427.

Proposal to abandon approved, as submitted by the owners, following recommendations issued by this department in Report No. P 4-1308.

DEVIL'S DEN FIELD.

T. 25 S., R. 18 E., M.D.B. & M.

SECTION 32.

Devils Den Consolidated Oil Co.

Well No. 1, abandon. P 4-906.

Proposal not considered pending the arrival from the company of sufficient and necessary data. Company notified that they must furnish this department with duplicate signed copies of the log of the well made out on form No. 100, complete history of the well in duplicate, form No. 103, and a subsequent work report (No. 102) covering that portion of the abandonment already done.

LOST HILLS FIELD.

T. 26 S., R. 20 E., M.D.B. & M.

SECTION 3.

Associated Oil Co.

Well No. 2, shut off. T 4-534.

Water shut-off approved with understanding that the company may have to make another shut-off should certain conditions arise.

Well No. 2, shut off. T 4-599.

Top water shut-off approved.

Well No. 2, drill. P 4-999.

Supplementary proposal to drill approved with recommendations.

Well No. 2, shut off. T 4-1014.

Shut-off successfully prevents water from above 2540′ from reaching sands below that depth.

Well No. 2, drill. P 4-1296.

Supplementary proposal drill approved.

B. B. & E. R. Dudley Petroleum Co.

Well No. 2, redrill. P 4-1492.

Proposal rejected because the company failed to furnish this department with sufficient data.

SECTION 11.

Associated Oil Co.

Well No. 1, shut off. T 4-540.

Shut-off approved.

SECTION 12.

Baker & Henshaw Oil Co.

Well No. 1, abandon. P 4-925.

Proposal to pull casing and plug hole answered with recommendations.

Well No. 2, abandoned. P 4-927.

Proposal to abandon well in accordance with the Mining Bureau specifications and leave the well in condition to convert into a water well above the depth of 300′, answered with recommendations that the hole be plugged above and below all gas sands encountered in the previous drilling. In attempting to follow out these recommendations the company experienced considerable difficulty and asked that certain specifications be modified. Upon refusal of the bureau to do so the company referred the matter to the District Oil and Gas Commissioners, and the specifications were modified by the board in a manner satisfactory to both the company and this department. These specifications were officially sent to the company in the report, No. P 4-1251.

Well No. 2, abandon. P 4-1251.

Supplementary proposal to abandon in accordance with the decision of the District Oil and Gas Commissioners, answered approving the company's plan to drill to 1670′ and fill back to 1270′ with cement against the walls of the hole, specifying in detail, plugging, and shooting in such a manner as to adequately protect surrounding territory.

The company experienced considerable mechanical difficulties in carrying out the above recommendations and declared them impractical and impossible, owing to the gas pressure encountered. They then asked for a further revision of specifications.

At a special meeting of the District Oil and Gas Commissioners it was unanimously voted that the company be required to do the work in accordance with their original decision (as stated in Report No. P 4-1251), that the hole be cleaned out to 1670′ and filled solid with cement to within 15′ or 20′ of the shoe of the 8¼″ casing.

Well No. 3, deepen. P 4-628.

Proposal to deepen rejected as as submitted and specifications as to the proper procedure given.

Baker & Henshaw Oil Co.—Continued.

Well No. 3, shut off. T 4-719.

This test was to determine whether or not the top oil sand was protected from water sands below shoe of shut-off string. The shut-off was approved.

Well No. 3, shut off. T 4-826.

This test was on casing placed to shut off water below oil sand mentioned in Report No. T 4-628, and was not witnessed by this department. Further tests recommended to be witnessed by this department.

Well No. 3, shut off. T 4-838.

Shut-off approved.

Well No. 3, abandon. P 4-926.

Proposal approved, conditionally.

Well No. 3, witness work. T 4-945.

A member of this department witnessed the fact that the well had been drilled to 1002′.

Well No. 3, shut off. T 4-1096.

Test to determine source of water. Test indicated water coming from upper sand. Recommendations were made and submitted as to proper method of continuing abandonment under these conditions.

SECTION 13.

Associated Oil Co.

Well No. 10, shut off. T 4-601.

Approved.

Well No. 20, shut off. T 4-603.

Rejected.

Well No. 20, abandon. P 4-729.

Proposal rejected, pending the receipt of more data from the company.

Well No. 25, shut off. T 4-602.

Approved.

General Petroleum Corp.

Well No. 2-B, drill. P 4-561.

Approved.

Well No. 3-B, drill. DD-915.

Approved.

Well No. 8-B, drill. DD-916.

Approved.

Well No. 12-B, drill. DD-917.

Approved.

Well No. 13-B, drill. P 4-564.

Approved.

Well No. 16-B, drill. P 4-563.

Approved.

Well No. 20-B, drill. DD-918.

Approved.

SECTION 24.

California Star Oil Co.

Well No. 2, drill. DD-914.

Approved.

Well No. 16, drill. P 4-744.

Approved.

Well No. 19, drill. P 4-685.

Approved.

Well No. 23, drill. P 4-775.

Approved.

Well No. 26, drill. P 4-623.

Approved.

Well No. 30, redrill. P 4-540.

Approved, with recommendations.

Security Oil Co.
  Well No. 3, deepen. P 4-1149.
    Proposal approved.
  Well No. 4, deepen. P 4-1410.
    Proposal rejected.
  Well No. 4, deepen. P 4-1482.
    Proposal approved.
  Well No. 5, drill. P 4-1297.
    Approved.
  Well No. 6, drill. P 4-1242.
    Proposal approved, with understanding that should top water be encountered this department be notified and a proper shut-off made.
  Well No. 16, alter casing. P 4-624.
    Work as proposed approved.
  Well No. 17, drill. P 4-568.
    Proposal approved.
  Well No. 17, abandon. P 4-1040.
    Proposal to abandon approved, with recommendations.
  Well No. 17, report of abandonment. P 4-1269.
    Abandonment approved.
  Well No. 25, drill. P 4-569.
    Proposal to drill approved.
  Well No. 25, drill. P 4-641.
    Supplementary proposal to drill approved.

T. 26 S., R. 21 E., M.D.B. & M.

SECTION 19.

General Petroleum Corp.
  Well No. 5, drill. P 4-1098.
    Approved.
  Well No. 5, shut off. T 4-1032.
    Shut-off approved.
  Well No. 10, drill. P 4-1474.
    Proposal approved.
  Well No. 16, deepen. P 4-1361.
    Proposal to deepen on account of excess water approved.
  Well No. 18, shut off. T 4-1263.
    Prospect shut off to determine amount of water in formations below depth of 367 feet.
  Well No. 20, deepen. P 4-575.
    Proposal approved.
  Well No. 21, drill. P 4-564.
    Approved, with recommendations.
  Well No. 31, drill. P 4-565.
    Proposal approved.
  Well No. 44, redrill. P 4-1486.
    Proposal approved, with the proviso that the company do certain recommended work.
  Well No. 61, drill. P 4-501.
    Approved, with recommendation that a water string be landed should top water be encountered.
  Well No. 64-A, drill. P 4-743.
    Proposal approved.
  Well No. 70, drill. P 4-847.
    Approved.
  Well No. 70, drill. P 4-993.
    Supplementary proposal to drill approved with recommendations.
  Well No. 70, supplementary, drill. P 4-1073.
    Approved, with recommendations.

General Petroleum Corporation—Continued.

Well No. 70, abandon. P 4-1136.

Approved, with recommendations.

Well No. 71, drill. P 4-502.

Proposal approved, with recommendation that water string be landed should top water be encountered.

Well No. 75, shut off. T 4-530.

Final approval not given on account of the large amount of oil in the hole. Passed for production test.

Well No. 78, redrill. P 4-660.

Proposal approved.

Well No. 78-A, redrill. P 4-661.

Proposal approved.

Well No. 98, drill. P 4-566.

Proposal approved.

Well No. 98, shut off. T 4-1237.

Test inconclusive. Another test recommended.

Well No. 98, shut off. T 4-1238.

Shut-off satisfactory.

Well No. 99, drill. P 4-503.

Proposal approved with recommendation that a water string be landed if top water is encountered.

Well No. 104, redrill. P 4-789.

Proposal approved.

Well No. 106, drill. P 4-504.

Proposal answered with recommendation that water string be landed should top water be encountered.

Well No. 107, drill. P 4-567.

Proposal approved.

Well No. 107, supplementary, drill.

Approved.

Well No. 115, drill. P 4-505.

Proposal approved, with recommendation that water string be landed if top water is encountered.

Well No. 115, shut off. T 4-1241.

Shut-off rejected.

Well No. 115, shut off. T 4-1242.

Test unsatisfactory. Recommended that certain work be done and another test made.

Well No. 115, shut off. T 4-1275.

Test unsatisfactory. Another test recommended.

Well No. 115, shut off. T 4-1276.

Test inconclusive. Remedial recommendations made.

Well No. 115, shut off. T 4-1277.

This test made as specified in Report No. T 4-1276. Recommended that the hole be redrilled as specified in Report No. P 4-1309.

Well No. 115, redrill. P 4-1309.

Approved redrilling to exclude top water from top oil sand.

Well No. 115, shut off. T 4-1292.

Recommended that the company drill ahead to 495′ and call this department to witness a test to determine source of water in hole.

Well No. 115, shut off. T 4-1342.

Recommendations as to future work on well.

Well No. 115, shut off. T 4-1352.

Shut-off approved for purposes of prospecting ahead.

Well No. 115, supplementary, drill. P 4-1459.

Proposal approved with the understanding that this approval is not to be taken as a precedent in drilling other wells in this territory.

General Petroleum Corporation—Continued.

Well No. 115, shut off. T 4-1353.

Shut-off approved for the purpose of prospecting ahead.

Well No. 115, supplementary, drill. P 4-1484.

Proposal approved; this department to witness a test of the productivity of the sand at 839′ before operations are carried on.

SECTION 29.

Associated Oil Co.

Well No. 2-D, drill. P 4-578.

Proposal rejected in its original form. Recommendations as to correct depth for shut-off were made.

Well No. 2-D, shut off. T 4-668.

Shut-off approved.

Well No. 3-C, shut off. T 4-634.

Shut-off approved.

Well No. 3-D, drill. P 4-829.

Proposal approved.

Well No. 3-D, shut off. T 4-848.

Shut-off approved.

Well No. 2-E, drill. P 4-961.

Approved.

Well No. 2-E, shut off. T 4-921.

Shut-off approved.

SECTION 30.

Devils Den Consolidated Oil Co.

Well No. 11, deepen. P 4-1160.

Proposal to deepen on account of large water production approved with recommendations as to method to be used.

Well No. 11, shut off. T 4-1190.

Shut-off and sealing intermediate oil and water sands by the mud-laden fluid process approved.

SECTION 32.

Universal Oil Co.

Well No. 21, deepen and redrill. P 4-1357.

Proposal approved and recommendations given as to method of protecting sands with mud-laden fluid.

T. 27 S., R. 19 E., M.D.B. & M.

SECTION 8.

Standard Oil Co.

Well No. 1, Mercantile, abandon. P 4-1402.

Proposal to abandon answered with detailed specifications for the abandonment of the well and modified by letter to the company, June 4, 1918.

T. 27 S., R. 20 E., M.D.B. & M.

SECTION 20.

Petroleum Midway Oil Co.

Well No. 1, abandon. P 4-939.

Proposal to abandon on account of no oil being encountered answered with specifications for abandonment.

SECTION 26.

Belridge Oil Co.

Well No. 14, shut off. T 4-572.

Passed for pumping test.

Well No. 14, shut off. T 4-672.

Pumping test indicates water effectually shut off from entering sands below 4131′. Water flowing between 6¼″ and 8¼″ casing shows that any sands between 4131′ and 3989′ are being flooded.

Belridge Oil Co.—Continued.

Well No. 14, drill. P 4-718.

This proposal was received after three tests of shut-off had been made by this department. Because of irregular methods in drilling, the well as drilled was not approved, as later developments might show that damage is being done.

Well No. 14, shut off. T 4-750.

Shut-off on 4½″ casing at 4316′ approved.

Well No. 14, supplementary, drill. P 4-1134.

Proposal answered giving company permission to do proposed work with understanding that the company is not relieved from the obligation of correcting conditions should future developments indicate its necessity.

Well No. 14, shut off. T 4-1034.

Test inconclusive due to the great amount of gas and fluid in the hole. This department recommended the well be put on the producing list and a production test be made later.

Well No. 14, abandon. P 4-1147.

Proposal answered with complete specifications for abandonment.

Well No. 15, shut off. T 4-571.

Approved.

SECTION 34.

Standard Oil Co.

Well No. 1, abandon. P 4-1119.

Proposal to abandon on account of no commercial quantity of oil being encountered, approved.

SECTION 35.

Belridge Oil Co.

Well No. 3, redrill. P 4-796.

Proposal to redrill on account of well stopping flowing, approved conditionally.

Well No. 3, deepen. P 4-816.

Approved.

Well No. 3, shut off. T 4-1108.

Shut-off approved.

Well No. 9, shut off. T 4-563.

Approved, with recommendations.

Well No. 9, shut off. T 4-710.

Shut-off by 8¼″ casing approved.

Well No. 17, drill. P 4-1353.

Proposal rejected.

Well No. 17, supplementary, drill. P 4-1407.

Proposal approved for the experimental testing of the mud-laden fluid method of protecting oil sands.

Union Oil Co.

Well No. 1, shut off. T 4-503.

Rejected.

Well No. 1, deepen. P 4-711.

Approved.

Well No. 2, Belridge, drill. P 4-786.

Proposal approved conditionally.

Well No. 2, Belridge, shut off. T 4-822.

Test inconclusive.

Well No. 2, Belridge, shut off. T 4-1073.

This production test on shut-off indicates presence of water in damaging amounts. Company asked to submit proposal covering work necessary to correct present conditions.

Well No. 3, Belridge, drill. P 4-1069.

Proposal approved conditionally.

Union Oil Co.—Continued.

Well No. 3, Belridge, redrill. P 4-1216.

Proposal approved conditionally.

Well No. 3, Belridge, shut off. T 4-1160.

Shut-off approved conditionally awaiting further prospecting of sands, above shut-off point of this well, on surrounding property.

Well No. 4, Belridge, drill. P 4-1070.

Proposal approved with recommendations as to landing water string.

Well No. 4, Belridge, shut off. T 4-1269.

The company made two attempts to land the water string, each attempt being made without notifying or getting the approval of this department. The second attempt at shut-off was tested by this department and approved (this report), conditionally.

Well No. 4, Belridge, supplementary, drill. P 4-1464.

Proposal approved conditionally.

Well No. 9, Belridge, drill. P 4-1471.

Proposal approved with recommendations as to landing water string.

Well No. 10, Belridge, drill. P 4-1472.

Proposal approved with recommendations as to landing water string.

Well No. 1, Fee, supplementary, drill. P 4-1218.

Proposal approved conditionally.

Well No. 1, Fee, shut off. T 4-1197.

Test inconclusive.

Well No. 1, Fee, shut off. T 4-1216.

Passed conditionally. Final decision to be given after a production test has been made.

Well No. 2, Gibson, shut off. T 4-1070.

Condition of well unsatisfactory.

Well No. 3, Gibson, drill. P 4-785.

Rejected with recommendations.

Well No. 3, Gibson, supplementary drill. P 4-1217.

Proposal approved conditionally.

Well No. 3, Gibson, shut off. T 4-1224.

Test inconclusive, due to plug in casing.

Well No. 3, Gibson, shut off. T 4-1225.

This test as recommended in Report No. T 4-1224.

Shut-off approved conditionally.

Well No. 4, Gibson, drill. P 4-1067.

Proposal approved, with recommendations as to landing water string.

Well No. 10, Gibson, drill. P 4-1068.

Proposal approved, with recommendations as to landing water string.

Well No. 10, Gibson, shut off. T 4-1109.

Test inconclusive, due to short time well stood before test. Passed for production test.

Well No. 1, Gibson-Fee, supplementary drill. P 4-1238.

Proposal approved, conditionally.

Well No. 2, Gibson-Fee, drill. P 4-1066.

Proposal approved, conditionally.

Well No. 8, Gibson-Fee, drill. P 4-1065.

Proposal approved, with recommendations as to landing water string.

Well No. 8, Gibson-Fee, supplementary drill. P 4-1473.

Proposal rejected. Complete specifications covering work submitted by this department.

T. 27 S., R. 21 E., M.D.B. & M.

SECTION 4.

General Petroleum Corp.

Well No. 4, redrill. P 4-574.

Proposal approved.

General Petroleum Corporation—Continued.
Well No. 56, redrill. DD-919.
Proposal approved.

Standard Oil Co.
Well No. 16, redrill. P 4-1467.
Proposal approved.
Well No. 51, redrill. P 4-1332.
Proposal to redrill account of well stopping flow, approved.

SECTION 5.

General Petroleum Corp.
Well No. 2-B, redrill. P 4-572.
Proposal to redrill account of no production, approved.

Standard Oil Co.
Well "Vulcan" No. 1, redrill. P 4-840.
Proposal to redrill account of well making 95% water, approved.
Well "Vulcan" No. 1, supplementary redrill. P 4-933.
Proposal approved, with additional recommendations.
Well "Vulcan" No. 1, supplementary redrill. P 4-986.
Proposal answered, with specifications for carrying out work.
Well "Vulcan" No. 1, shut off. T 4-996.
Shut-off approved.

Universal Oil Co.
Well No. 2, redrill. P 4-790.
Proposal approved, conditionally.
Well No. 2, shut off. T 4-800.
Shut-off approved.

BELRIDGE FIELD.

T. 28 S., R. 20 E., M.D.B. & M.

SECTION 1.

Belridge Oil Co.
Well No. 18, drill. P 4-1493.
This proposal canceled and nullified by Report No. P 4-1637. Approved.

SECTION 11.

State Consolidated Oil Co.
Well No. 1, alter casing. P 4-900.
Proposal approved, conditionally.
Well No. 1, deepen and redrill. P 4-1249.
Proposal approved.

T. 28 S., R. 21 E., M.D.B. & M.

SECTION 28.

Belridge Oil Co.
Well No. 10-D, deepen. P 4-688.
Proposal answered, with specifications for deepening.
Well No. 10-D, abandon. P 4-1144.
Proposal rejected, pending more data from the company.
Well No. 10-D, supplementary abandon. P 4-1199.
Proposal to abandon answered, with specifications for satisfactorily completing the work. This report to supercede and nullify Report No. P 4-1144.

SECTION 30.

Pittsburg-Belridge Oil Co.
Well No. 1, redrill. P 4-715.
Approved.
Well No. 1, shut off. T 4-700.
Test inconclusive. Final decision withheld, pending result of bailing test.

Pittsburg-Belridge Oil Co.—Continued.

Well No. 1, shut off. T 4-1236.

This test in accordance with recommendations in Report No. T 4-700. The pumping test showed 2.0% water. The shut-off is approved.

SECTION 33.

Belridge Oil Co.

Well No. 5-D, production test. T 4-729.

This test showed that water above 2578′ is prevented from entering sands below that depth, but this department has been given no opportunity to determine whether or not formations above that depth have been properly protected.

Well No. 6-D, drill. P 4-533.

Proposal approved.

Well No. 6-D, supplementary drill. P 4-591.

Proposal approved.

Well No. 6-D, shut off. T 4-677.

Test indicated that water above point of shut-off is successfully excluded from formations below.

Well No. 6-D, supplementary drill. P 4-792.

Superceded by Report No. P 4-804.

Well No. 6-D, supplementary drill. P 4-804.

Proposal approved.

Well No. 6-D, shut off. T 4-768.

Recommendations that the hole be drilled in and a production test made.

Well No. 6-D, deepen. P 4-966.

Proposal approved, with recommendations.

Well No. 6-D, shut off. T 4-1056.

Test showed all formations below 3296′ are protected from water above that point. Approval not given because the company failed to comply with the bureau's specifications regarding protection of formations between landing points of the two strings of casing.

Well No. 6D, abandon. P 4-1293.

Proposal answered, with rejection and complete specifications for proper abandonment.

Well No. 7-D, drill. P 4-588.

Approved.

Well No. 7-D, shut off. T 4-654.

Shut-off approved.

Well No. 7-D, supplementary drill. P 4-894.

Proposal approved, with additional recommendations.

Well No. 7-D, deepen. P 4-964.

Proposal approved.

Well No. 7-D, redrill. P 4-1099.

Proposal rejected, due to the fact that the company failed to notify this department of tests.

Well No. 7-D, supplementary drill. P 4-1165.

Proposal approved. Company advised that this department must be notified to witness all tests of shut-off, whether successful or not.

Well No. 7-D, shut off. T 4-1291.

Shut-off rejected. Permission to drill ahead conditionally given.

Well No. 8-D, drill. P 4-590.

Approved.

SECTION 34.

Belridge Oil Co.

Well No. 9-D, drill. P 4-748.

Due to an error in the company's notice, this well was reported as located in section 33, T. 28 S., R. 21 E., instead of in section 34 of the same township and range. This report was later canceled and superceded by Report No. P 4-1677.

Belridge Oil Co.—Continued.

Well No. 11-D, drill. P 4-749.

Proposal approved. Due to an error in the company's notice, this well was located in section 33, as was Well No. 9-D.

T. 29 S., R. 20 E., M.D.B. & M.

SECTION 36.

Shear Petroleum Co.

Well No. 13, drill. P 4-531.

Proposal approved.

T. 29 S., R. 21 E., M.D.B. & M.

SECTION 1.

Reward Oil Co.

Well No. 2, drill. P 4-815.

Approved.

Well No. 2, shut off. T 4-908.

Shut-off approved.

Well No. 2, shut off. T 4-1146.

Shut-off rejected.

Well No. 2, supplementary drill. P 4-1273.

Proposal to recement approved.

Well No. 2, supplementary drill. P 4-1283.

Approved, with recommendations.

Well No. 2, shut off. T 4-1222.

Rejected.

Well No. 2, shut off. T 4-1329.

Test inconclusive. Another test recommended.

Well No. 2, shut off. T 4-1336.

Test inconclusive. Another test recommended.

Well No. 2, shut off. T 4-1337.

Test failed to show source of water. Recommendations made as to method of more accurately locating water.

SECTION 2.

General Petroleum Corp.

Well No. 98, shut off. T 4-560.

Approval not given, because the company failed to furnish this department with complete information.

Well No. 98, shut off. T 4-725.

Test to determine the amount of water produced by pumping. In view of the fact that the water might be exhausted by continuous pumping, further pumping was recommended.

Well No. 99, shut off. T 4-606.

Shut-off approved.

Well No. 122, shut off. T 4-525.

Shut-off approved.

Well No. 125, shut off. T 4-519.

Shut-off satisfactory.

Well No. 126, shut off. T 4-658.

Shut-off approved.

Well No. 127, shut off. T 4-605.

Shut-off approved.

Well No. 140, drill. P 4-1062.

Proposal approved.

Well No. 141, drill. P 4-973.

Proposal approved.

Well No. 141, shut off. T 4-1196.

Shut-off rejected, with recommendations.

General Petroleum Corporation—Continued.

Well No. 141, supplementary drill. P 4-1355.

Proposal approved.

Well No. 141, shut off. T 4-1266.

Shut-off approved for prospecting purposes.

Well No. 141, shut off. T 4-1328.

This shut-off approved for prospecting ahead in an endeavor to locate a tar sand carrying water. When this is located the company is to shut off as approved in Report No. P 4-1355.

Well No. 142, drill. P 4-974.

Proposal approved.

Well No. 142, shut off. T 4-1072.

Test inconclusive, due to plug in casing. Later tested by this department and found wet. As source of water was doubtful, it was agreed to drill ahead in an endeavor to locate sand.

Well No. 142, supplementary drill. P 4-1195.

Proposal to drill ahead, landing second water string mentioned in Report No. T 4-1072, approved.

Well No. 142, shut off. T 4-1169.

Test on second water string approved.

Well No. 142, supplementary, drill. P 4-1280.

Proposal to land third water string approved.

Well No. 142, shut off. T 4-1215.

Approved.

Well No. 142, shut off. T 4-1298.

Test showed water above 670′ successfully excluded from formations below that depth. The company had three water strings in this hole. As per proposal, approved by this department in Report No. P 4-1355, they loosened and relanded the second string at a point below the original landing of the third string.

Well No. 149, drill. P 4-514.

Proposal approved.

Well No. 149, shut off. T 4-704.

Recommended a new shut-off be made.

Well No. 149, shut off. T 4-721.

Shut-off approved.

Well No. 150, drill. P 4-507.

Proposal approved.

Well No. 150, shut off. T 4-803.

Shut-off rejected, due to the fact that the company had shut off 45′ lower than proposed and approved by this department without submitting information showing why the change was necessary.

Well No. 151, drill. P 4-508.

Proposal approved.

Well No. 151, shut off. T 4-753.

Recommended that the hole be bailed out, after cleaning, and another test made with screen pipe.

Well No. 151, shut off. T 4-761.

Shut-off approved.

Well No. 152, drill. P 4-513.

Proposal approved.

Well No. 152, shut off. T 4-722.

Shut-off approved.

Well No. 153, drill. P 4-509.

Proposal approved.

Well No. 153, shut off. T 4-777.

Shut-off approved.

Well No. 154, drill. P 4-510.

Proposal approved.

General Petroleum Corporation—Continued.

Well No. 154, shut off. T 4-820.

Shut-off rejected because the company shut off 28′ lower than they proposed without notifying this department.

Well No. 154, supplementary, drill. P 4-937.

Proposal approved conditionally.

Well No. 154, shut off. T 4-889.

Shut-off approved. This report to supercede and nullify report No. T 4-820.

Well No. 155, drill. P 4-511.

Proposal approved.

Well No. 155, shut off. T 4-865.

Shut-off approved.

Well No. 156, drill. P 4-512.

Proposal approved.

Well No. 156, shut-off. T 4-843.

Shut-off approved.

Well No. 174, drill. P 4-1120.

Proposal approved.

Well No. 174, shut off. T 4-1369.

Shut-off approved.

Well No. 175, drill. P 4-1010.

Proposal approved.

Well No. 175, shut off. T 4-1294.

Shut-off rejected. Recommendations submitted.

Well No. 175, supplementary, drill. P 4-1343.

Proposal approved as a temporary measure to aid in prospecting ahead.

Well No. 175, shut off. T 4-1375.

Shut-off approved.

Well No. 175, supplementary, drill. P 4-1499.

Proposal approved.

Well No. 176, drill. P 4-1014.

Proposal approved.

Well No. 176, shut off. T 4-1114.

Shut-off approved.

Well No. 177, drill. P 4-1015.

Proposal approved.

Well No. 177, shut off. T 4-906.

Shut-off approved.

Well No. 178, drill. P 4-1016.

Proposal approved.

Well No. 178, shut off. T 4-967.

Shut-off approved.

Well No. 178, supplementary, drill. P 4-1095.

Proposal approved.

Well No. 178, shut off. T 4-1006.

Test inconclusive due to plug in casing.

Well No. 178, shut off. T 4-1007.

Shut-off by 10″ as a temporary measure approved.

Well No. 178, shut off. T 4-1092.

Test inconclusive due to the great amount of tar sand in the hole.

Well No. 178, shut off. T 4-1097.

Test inconclusive. Another test recommended.

Well No. 178, shut off. T 4-1100.

Shut-off approved.

Well No. 179, drill. P 4-1017.

Proposal approved.

General Petroleum Corporation—Continued.

Well No. 180, drill. P 4-1005.

Proposal approved.

Well No. 181, drill. P 4-1006.

Proposal approved.

Well No. 182, drill. P 4-1007.

Proposal approved.

Well No. 183, drill. P 4-1008.

Proposal approved.

Well No. 184, drill. P 4-1009.

Proposal approved.

Well No. 184, shut off. T 4-1131.

Shut-off approved.

Well No. 185, drill. P 4-1060.

Proposal approved.

Well No. 186, drill. P 4-1061.

Proposal approved.

Well No. 187, drill. P 4-1132.

Proposal approved.

SECTION 3.

Marina Oil Co.

Well No. 6, shut off. T 4-554.

Approval not given on account of the failure of the company to furnish complete data.

Well No. 7, drill. DD-920.

Proposal approved.

Well No. 7, supplementary drill. P 4-1176.

Proposal approved.

Well No. 7, shut off. T 4-1249.

Shut-off approved.

Well No. 8, drill. DD-921.

Proposal approved.

Well No. 8, supplementary drill. P 4-1167.

Proposal approved.

Well No. 8, shut off. T 4-1338.

Test inconclusive. Another test recommended.

Well No. 8, shut off. T 4-1339.

Shut-off approved.

Well No. 8, supplementary, drill. P 4-1500.

Proposal approved.

Well No. 8, shut off. T 4-1386.

Test inconclusive. This department recommended that hole be cleaned and bailed for another test.

Well No. 10, shut off. T 4-555.

Passed, conditionally.

Well No. 10, redrill. P 4-1103.

Proposal approved.

Well No. 10, shut off. T 4-1057.

Test inconclusive. Another test recommended.

Well No. 10, shut off. T 4-1058.

Shut-off approved. Company requested to submit supplementary notice outlining further proposed operations.

Well No. 10, supplementary drill.

Proposed work approved.

Well No. 10, shut off. T 4-1176.

Test inconclusive. Another test recommended.

Well No. 10, shut off. T 4-1177.

Shut-off approved.

Marina Oil Co.—Continued.

Well No. 10, supplementary drill. P 4-1351.

Proposal approved.

Well No. 10, shut off. T 4-1325.

Shut-off rejected; recommended recementing.

Well No. 14, drill. DD-926.

Proposal approved.

Well No. 14, shut off. T 4-944.

Shut-off approved.

Well No. 15, drill. DD-922.

Proposal approved.

Well No. 15, shut off. T 4-991.

Shut-off approved.

Well No. 16, drill. DD-923.

Proposal approved.

Well No. 16, shut off. T 4-1103.

Shut-off approved.

Well No. 16, supplementary drill. P 4-1253.

Proposal approved, with recommendations.

Well No. 16, shut off. T 4-1163.

Test indeterminate due to leaky bridge.

Well No. 16, shut off. T 4-1164.

This test was made in an endeavor to locate source of water in this well, which it did not do. Another test was recommended with specifications covering work necessary to carry out same.

Well No. 16, shut off. T 4-1171.

This test was made in accordance with recommendations outlined in Report No. T 4-1164, and as a result of this test further recommendations were issued to cover conditions on this well.

Well No. 16, shut off. T 4-1258.

Specifications made in Report No. T 4-1164 carried out and this test made. The shut-off was approved.

Well No. 16, supplementary drill. P 4-1497.

Proposal approved.

Well No. 19, production test. T 4-724.

Pumping test to locate source of water failed. Further pumping recommended.

Well No. 21, shut off. T 4-577.

Shut-off approved.

Well No. (old) 23, abandon. P 4-841.

Proposal to abandon on account of mechanical difficulties encountered in drilling, approved, with the understanding that should future developments show sands to be of any commercial value, it will be necessary for the company to protect such sands by remedying existing conditions.

Well No. (new) 23, drill. P 4-842.

Proposal approved.

Well No. (new) 23, shut off. T 4-799.

Shut-off approved.

Well No. 24, drill. P 4-547.

Proposal approved.

Well No. 24, supplementary drill. P 4-1184.

Proposal approved.

Well No. 25, drill. P 4-548.

Proposal approved.

Well No. 25, supplementary drill.

Proposal approved.

Well No. 26, drill. P 4-549.

Proposal approved.

Marina Oil Co.—Continued.

Well No. 27, drill. P 4-550.

Proposal approved. The company later notified this department that owing to a change in their drilling program the well would not be drilled.

Well No. 30, shut off. T 4-806.

Shut-off approved.

Well No. 31, drill. P 4-551.

Proposal approved.

Well No. 33, drill. P 4-553.

Proposal approved.

Well No. 34, drill. P 4-554.

Proposal approved. The company later notified this department that owing to a change in drilling program, this well would not be drilled.

Well No. 35, shut off. T 4-617.

Shut-off approved.

Well No. 36, shut off. T 4-521.

Shut-off approved.

Well No. 36, deepen and redrill. P 4-1100.

Proposal approved, with recommendations.

Well No. 36, shut off. T 4-1143.

Test inconclusive. Another test recommended.

Well No. 36, shut off. T 4-1153.

This report to cancel and waive recommendations in Report No. T 4-1143. Recommended that the company go ahead as outlined in Report No. P 4-1100.

Well No. 36, shut off. T 4-1181.

Test to determine whether or not certain sands carry water. Company given permission to proceed with operations as per Report No. P 4-1100.

Well No. 36, shut off. T 4-1344.

Test inconclusive. Redemial work recommended.

Well No. 37, drill. DD-924.

Proposal approved.

Well No. 37, shut off. T 4-862.

Shut-off approved.

Well No. 37, shut off. T 4-1021.

Test inconclusive.

Well No. 37, shut off. T 4-1022.

Test indicates well making water. Company's proposal to let stand for another test approved.

Well No. 37, supplementary drill. P 4-1194.

Proposal approved, conditionally.

Well No. 38, drill. P 4-555.

Proposal approved.

Well No. 39, drill. P 4-556.

Proposal approved.

Well No. 40, drill. P 4-557.

Proposal approved.

Well No. 41, drill. P 4-558.

Proposal approved. The company later notified this department that owing to a change in drilling program, this well would not be drilled.

Well No. 42, shut off. T 4-770.

The water string in this well was landed and cemented 30′ deeper than proposed, but owing to the fact that the company used 160 sacks of cement in the work, it was approved by this department.

Well No. 42, shut off. T 4-797.

Shut-off approved.

Well No. 42, supplementary drill. P 4-912.

Proposal approved.

Marina Oil Co.—Continued.

Well No. 51, shut off. T 4-877.

Shut-off approved.

Well No. 55, shut off. T 4-505.

Shut-off approved.

SECTION 8.

Standard Oil Co.

Well No. 1, shut off. T 4-717.

Test shows 10″ casing cemented at 3150′ effectually prevents any water above that point from infiltrating to the formations below the shoe of the 10″.

Well No. 1, abandon. P 4-1093.

Proposal to abandon answered with complete specifications for effectually carrying out the work.

Well No. 1, supplementary abandon. P 4-1258.

Proposal approved, with recommendations.

SECTION 11.

General Petroleum Corp.

Well No. 8-B, drill. P 4-846.

Proposal approved.

Well No. 8-B, supplementary drill. P 4-915.

Proposal approved, conditionally.

Well No. 14-B, shut off. T 4-518.

Shut-off unsatisfactory. A further proposal recommended.

Well No. 14-B, shut off. T 4-594.

Test inconclusive. Further bailing tests or a pumping test recommended.

Well No. 14-B, abandon. P 4-828.

Proposal to abandon on account of non-productivity of sands, approved with added recommendations.

Well No. 14-B, supplementary abandon. P 4-994.

Proposal approved. This proposal was submitted in accordance with recommendations contained in Report No. P 4-828.

SECTION 12.

Marina Oil Co.

Well No. 1, drill. P 4-1003.

Proposal approved.

Well No. 1, supplementary drill. P 4-1036.

Proposal approved.

Well No. 1, shut off. T 4-1024.

Shut-off approved.

Well No. 1, supplementary drill. P 4-1187.

Proposal approved.

Well No. 1, shut off. T 4-1154.

Test inconclusive. Another test recommended.

Well No. 1, shut off. T 4-1158.

Shut-off approved.

Well No. 1, supplementary drill. P 4-1265.

Proposal approved, with understanding that should more water be encountered below the 8¼″ a proposed method of drilling under these conditions be submitted.

Well No. 1, supplementary drill. P 4-1298.

Proposal approved.

Well No. 1, shut off. T 4-1259.

Shut-off unsatisfactory. A deeper shut-off recommended.

Well No. 1, supplementary drill. P 4-1409.

Proposal approved.

Well No. 1, shut off. T 4-1356.

Test inconclusive. Recommended that the hole be bailed for another test.

Marina Oil Co.—Continued.

Well No. 1, shut off. T 4-1357.

Test indicates water coming in below shut-off. Recommended that the hole be drilled ahead and a shut-off be made in first suitable formation.

Well No. 1, supplementary drill. P 4-1498.

Proposal approved.

Section 21.

Standard Oil Co.

Well No. 3, drill. P 4-1333.

Proposal answered, with recommendations that the hole be drilled in such a manner that tests could be made on certain shallow oil sands.

Section 26.

Pacific Crude Oil Co.

Well No. 9, shut off. T 4-636.

Shut-off approved.

Well No. 9, abandon. P 4-922.

Proposal to abandon answered with specifications by this department.

Well No. 9, witness work. P 4-876.

Witnessed mudding, in accordance with Report No. P 4-922. Work approved.

Well No. 9, witness work. T 4-896.

Member of this department witnessed the placing of a cement plug, as per Report No. P 4-922. Approved.

Well No. 9, abandon. P 4-983.

Proposal answered, with complete specifications as to proper method of abandonment.

Well No. 9, witness work. T 4-928.

Member of this department witnessed the mudding, under pressure, of open hole. Approved.

Well No. 17, redrill. P 4-1502.

Proposal approved, with recommendations.

Well No. 53, shut off. T 4-1126.

Previous test showed 60′ plug in casing. This production test was made in accordance with recommendations made at that time. Test showed 60% water. Recommended that company submit proposal stating in detail what they plan to do to correct existing conditions.

Well No. 55, drill. P 4-645.

Proposal approved.

Well No. 55, shut-off. T 4-886.

Test not conclusive. Well passed for production test.

Well No. 55, shut off. T 4-1019.

Records of well incomplete. Test indicates water in excessive amounts has access to well, and the condition of same is rejected. Recommended that the company submit a proposal outlining work necessary to improve conditions.

Well No. 55, bridge and test. P 4-1226.

Proposal approved. This department to witness test of shut-off.

Well No. 55, shut off. T 4-1309.

Test not conclusive. Another test recommended.

Well No. 55, shut off. T 4-1330.

Hole bridged for this test in an attempt to locate water. Test showed 8¼″ casing effectually shuts off water. Further tests recommended.

Well No. 57, drill. P 4-1049.

Proposal approved.

Well No. 57, shut off. T 4-1089.

Shut-off rejected. Recommended the company submit a supplementary proposal outlining a method of correcting existing conditions.

Well No. 57, shut off. T 4-1253.

Test inconclusive. Another test recommended.

Pacific Crude Oil Co.—Continued.
Well No. 57, shut off. T 4-1264.
Shut-off approved.
Well No. 57, supplementary drill. P 4-1422.
Proposal approved.
United Western Consolidated Oil Co.
Well No. 2, redrill. P 4-664.
Proposal approved, provided tar sands are thoroughly mudded before cementing.
Well No. 3, drill. P 4-541.
Proposal satisfactory, but approval withheld until receipt of signed copies of the logs of the company's wells.
Well No. 3, shut off. T 4-647.
Shut-off by 8¼″ satisfactory. Final decision as to condition of the well withheld, pending receipt of signed statement in duplicate of test made of shut-off by 11⅝″ casing.
Well No. 3, shut off. T 4-653.
Test indicates shut-off leaking or that water is returning through bridge. Well passed for production test.
Well No. 4, drill. P 4-646.
Proposal approved.

SECTION 27.

Standard Oil Co.
Well No. 2, Midway Premier, shut off. T 4-950.
Well passed for production test.
Well No. 2, Midway Premier, supplementary drill. P 4-1219.
Answer withheld approval pending receipt of signed copies of log.
Well No. 2, Midway Premier, supplementary drill. P 4-1229.
Proposal answered, with specifications.

SECTION 36.

West Penn Oil Co.
Well No. 1, shut off. T 4-614.
On account of sand heaving in the hole a satisfactory bailing test could not be made. Well passed for production test.
Standard Oil Co.
Well No. 2, shut off. T 4-511.
Well passed for production test, because of the large amount of oil in hole.

McKITTRICK FIELD.

T. 29 S., R. 22 E., M.D.B. & M.

SECTION 32.

Barnsdale, Drake and Yancy Oil Co.
Well No. 1, witness work. D-929.
Test indicated cement set at 1666′.

T. 30 S., R. 21 E., M.D.B. & M.

SECTION 11.

Southern Pacific Co., Fuel Oil Department.
Well No. 3, shut off. T 4-1069.
Reported production test not witnessed by this department, the results being obtained from monthly production reports submitted by the company. On the basis of these reports the shut-off was approved.
Well No. 4, shut off. T 4-624.
Shut-off approved.
Well No. 5, drill. P 4-1206.
Proposal approved.
Well No. 5, shut off. T 4-1257.
Shut-off approved.
Well No. 6, drill. P 4-1458.
Proposal approved.

Josephine Oil Co.

Well No. 2, redrill. P 4-880.

Proposal approved, in part, with recommendations covering balance of work.

Well No. 2, abandon. P 4-1489.

Proposal to abandon, on account of no commercial production, approved, with recommendations.

Jackson Oil Co.

Well No. 6, redrill. P 4-952.

Proposal to redrill oil string approved.

Well No. 9, shut off. T 4-517.

Shut-off approved.

Well No. 10, drill. P 4-621.

Proposal approved.

Well No. 10, shut off. T 4-772.

Approval was withheld on account of the fact that the casing was landed deeper then proposed and approved, and the consequent possibility that oil sands were cased off behind the water string.

Well No. 10, supplementary to drill. P 4-827.

Withheld approval to proposal to carry 10″ casing deeper until the result of the work could be observed. At the time of submitting proposal the work had already been done.

Well No. 11, drill. P 4-951.

Proposal approved conditionally.

Well No. 11, shut off. T 4-1101.

Test indicated that water above point of shut-off was effectually prevented from penetrating formations below that point. Shut-off approved, conditionally.

Well No. 12, drill. P 4-1336.

Proposal approved, conditionally.

Well No. 12, shut off. T 4-1297.

Shut-off approved, conditionally.

East Puente Oil Co.

Well No. 3, deepen and redrill. P 4-1191.

Proposal approved, conditionally.

Well No. 3, shut off. T 4-1120.

Shut-off rejected.

Well No. 3, shut off. T 4-1255.

Test inconclusive. Another test recommended.

Well No. 3, shut off. T 4-1326.

Passed for production test.

Well No. 6, shut off. T 4-546.

Shut-off approved.

Well No. 7, drill. DD-913.

Proposal approved.

Well No. 7, shut off. T 4-679.

Shut-off approved.

Well No. 8, drill. P 4-788.

Proposal approved.

Well No. 8, shut-off. T 4-943.

Because of the fact that the water string was landed 422′ deeper than proposed, and the further fact that the test was made with a 20′ plug in the hole, the test was unsatisfactory. This test was made by the company, in the presence of several witnesses from the surrounding leases.

Well No. 8, report on method of drilling. P 4-1142.

This report was issued following the receipt of a detailed statement from the company in regard to their having landed the water string at 1122′, or 422′ deeper than proposed in their notice of intention to drill of October 15, 1918, as approved in Report No. P 4-788, of October 25, 1918. The statement is as follows:

"The 11⅝" casing, the outer water string, was not used in shutting off the water for the following reasons: When we got down near the landing place, which is about 50' in the gray shale usually found between 700' and 800', the casing when allowed to stand very long would get tight, showing the effect of cave, so after getting it down where we wanted to land we could not keep it free long enough to cement, so it was left at 785', and we run the 9⅝" casing in and carried it to 1122', which was just on top of the oil sand; this string was then cemented with 4 tons in the bottom; we then loosened up the 11⅝" and tamped a sand bridge of 140' around the 9⅝", then pulled the 11⅝" out, and run 300' of 1¼" pipe down the outside of the 9⅝" and pumped 5 tons of cement on the sand bridge."

This method of drilling new oil wells was not approved by this department, as there was no means of showing that upper oil measures cased off behind the 9⅝" casing are not being damaged by top water.

The matter is being held in abeyance until such time as developments indicate whether this well is contributing to the already serious water condition in this vicinity.

Well No. 9, drill. P 4-968.

Proposal approved.

Well No. 9, shut off. T 4-979.

Shut-off approved.

Well No. 13, deepen and redrill. P 4-1295.

Proposal approved, conditionally.

Well No. 15, deepen. P 4-1182.

Proposal rejected, for lack of log.

Well No. 15, deepen. P 4-1227.

Proposal was received February 16, 1918. On March 12 this department received log of well, as per request in Report No. P 4-1182, from which data was obtained to the effect that the work had been completed. Approval was withheld.

Well No. 15, shut off. T 4-1180.

Test inconclusive, owing to the fact that the hole was bailed only to 600'. Another test recommended.

SECTION 12.

Southern Pacific Co., Fuel Oil Department.

Well No. 128, redrill. P 4-681.

Proposal to redrill, on account of collapsed oil string, approved, with recommendations.

Well No. 128, shut off. T 4-711.

Test to determine source of water. Test showed well making no top water. Recommended further tests.

Well No. 128, shut off. T 4-1062.

This was a production test made after plugging a tar sand and an oil sand. During a run of 127 days the well averaged 150 bbls. of fluid, 20% water and 30% emulsion. Source of water unknown. This department recommended that the company make tests to determine the source of this water and submit a proposal outlining a method of improving conditions.

SECTION 13.

Southern Pacific Co., Fuel Oil Department.

Well No. 17, redrill. P 4-793.

Proposal approved.

Well No. 18, abandoned. P 4-865.

Proposal approved.

Well No. 218, drill. P 4-1079.

Proposal approved.

Well No. 218, shut off. T 4-1053.

Shut-off approved.

Olig Crude Oil Co.

Well No. 2 (old), abandoned. P 4-1146.

Proposal rejected for lack of logs of the several wells drilled under this number.

Well No. 2 (new), drill. P 4-1145.

Proposal rejected, pending receipt of statement showing elevation and location of the well.

SECTION 14.

San Francisco and McKittrick Oil Co.

Well No. 13, deepen. P 4-735.

Proposal approved, production test to be made later.

Well No. 13, production test. T 4-1199.

This test in accordance with Report No. P 4-735. After 118 days the well was producing at the rate of 80 bbls. per day, of which 2.8% was water. As a result of this test the deepening was approved.

Well No. 14, deepen. P 4-745.

Proposal approved. Called for a production test to be made later.

Well No. 14, production test. T 4-1198.

This test made in accordance with Report No. P 4-745. After 91 days the well was producing at the rate of 60 bbls. of fluid, of which 3.2% was water. The deepening of the well was approved.

Well No. 17, deepen. P 4-546.

Proposal approved with the understanding that, should water be encountered while deepening, this department should be notified.

Well No. 18, deepen. P 4-878.

Deepening approved on the condition that, should water be encountered, this department be immediately notified. A production test to be made after completion of work.

Well No. 18, production test. T 4-1200.

Test made as specified in Report No. P 4-878. After 50 days the well was producing at the rate of 35 bbls. of fluid per day, of which 3.2% was water. Deepening approved.

T. 30 S., R. 22 E., M.D.B. & M.

SECTION 6.

Standard Oil Co., "Seabreeze."

Well No. 1, supplementary redrill. P 4-604.

Proposal approved; sufficient lime and cement to be used to seal all formations between the landing point of the new string of 10″ and the shoe of the 12½″ casing.

Well No. 1, shut off. T 4-580.

Well passed for production test.

Standard Oil Co., "McKittrick."

Well No. 3, shut off. T 4-520.

Shut-off satisfactory.

Well No. 3, redrill. P 4-1172.

Proposal approved.

Well No. 4, abandon. P 4-746.

Proposal answered with specifications for abandonment.

Nevada County Oil Co.

Well No. 47, redrill. P 4-895.

Proposal approved.

Well No. 47, supplementary redrill. P 4-943.

Proposal approved; shut-off to be witnessed. Recommended recementing instead of landing a new string of casing.

Well No. 48, drill. P 4-613.

Proposal approved.

Well No. 48, shut off. T 4-686.

After 130 days well was producing at the rate of 20 bbls. of fluid daily, with only a trace of water. Shut-off approved.

Nevada County Oil Co.—Continued.

Well No. 48, redrill. P 4-1113.

Proposal approved. 10″ water string not to be disturbed.

Well No. 49, drill. P 4-594.

Proposal approved.

Well No. 49, shut off. T 4-635.

Shut-off approved.

Well No. 50, drill. P 4-598.

Proposal approved.

Well No. 50, supplementary, drill. P 4-592.

Proposal approved; this department to witness mudding.

Well No. 50, shut off. T 4-1054.

Shut-off approved.

SECTION 8.

Standard Oil Company.

Well No. 2, "McKittrick," shut off. T 4-622.

Shut-off approved.

Well No. 2, "McKittrick," redrill. P 4-873.

Consideration of proposal withheld, pending receipt of duplicate signed copies of log.

Well No. 2, "McKittrick," supplementary drill. P 4-941.

Proposal approved conditionally.

Well No. 7, "McKittrick," drill. P 4-890.

Proposal approved conditionally.

Well No. 7, "McKittrick," supplementary drill. P 4-1177.

Proposal answered with specifications as to method of deepening.

Well No. 7, "McKittrick," shut off. T 4-1079.

Confirmed the company's report that the shut-off was ineffective due to the presence of water sand immediately below the shoe of the 12½″ casing.

Well No. 7, "McKittrick," supplementary drill. P 4-1222.

Proposal to drill out through 12½″ casing, and land 10″ casing for water string, approved.

SECTION 16.

Well No. 1, "Spreckels," shut off. T 4-670.

Shut-off approved.

Well No. 1, "Spreckels," supplementary redrill. P 4-907.

Consideration withheld pending receipt of signed copies of log.

Well No. 1, "Spreckels," supplementary redrill. P 4-930.

Proposal approved provided all formation cased off by the 8¼″ casing be mudded under pressure and cemented with at least 10 tons of cement.

Well No. 2, "Spreckels," supplementary drill. P 4-826.

Proposal approved with reservations.

Well No. 2, "Spreckels," shut off. T 4-839.

Shut-off approved with reservations.

Well No. 2, "Spreckels," special test. T 4-946.

Test indicates that oil showing from 3022′ to 3300′ is not productive.

Well No. 2, "Spreckels," redrill. P 4-1151.

Proposal approved with reservations.

Well No. 2, "Spreckels," supplementary, redrill. P 4-1318.

Proposal approved conditionally.

Well No. 2, "Spreckels," special test. T 4-1313.

Test inconclusive. Additional test recommended.

Well No. 2, "Spreckels," redrill. P 4-1429.

Proposal approved.

SECTION 20.

Southern Pacific Company, Fuel Oil Department.

Well No. 15, drill. P 4-1373.

Proposal approved conditionally.

Southern Pacific Co., Fuel Oil Department—Continued.
Well No. 15, shut off. T 4-1368.
Shut-off approved.

SECTION 34.

Doheny-Pacific Petroleum Co.
Well No. 1, abandon. P 4-680.
Proposal rejected, with recommendation.
Well No. 1, special test. T 4-870.
Placing of cement plug approved.

Combined Oil Company, "Belgian."
Well No. 3, abandon. P 4-539.
Proposal answered with specifications.

MIDWAY FIELD.

T. 31 S., R. 22 E., M.D.B. & M.

SECTION 2.

Doheny-Pacific Petroleum Co.
Well No. 1, redrill. P 4-1180.
Proposal approved.

Associated Oil Company.
Well No. 23, deepen. P 4-938.
Proposal approved conditionally.
Well No. 24, redrill. P 4-1203.
Proposal approved.
Well No. 33, drill. P 4-1118.
Proposal approved.
Well No. 33, shut off. T 4-1343.

Approval withheld owing to the fact that the shut-off was made 206′ deeper than proposed and approved, and without due notice to this department.

Well No. 34, drill. P 4-1046.
Proposal approved.
Well No. 34, shut off. T 4-1116.
Test inconclusive due to plug in casing. Further test recommended.
Well No. 34, shut off. T 4-1119.
Shut-off approved.
Well No. 34, shut off. T 4-1265
Shut-off approved.

SECTION 3.

Doheny-Pacific Petroleum Co.
Well No. 4, drill. P 4-905.
Proposal approved.
Well No. 4, shut off. T 4-883.
Recommended additional test.
Well No. 4, shut off. T 4-1144.

Test indeterminate, owing to fact that well was bailed only to 400′, and that bailer was run before arrival of inspector. Well passed for production test.

Well No. 5, drill. P 4-904.
Proposal approved.
Well No. 5, abandon. P 4-1371.
Consideration withheld pending receipt of signed copies of log and history of well.
Well No. 5, abandon. P 4-1416.
Proposal approved, with recommendations.
Well No. 5, special test. T 4-1348.
Test satisfactory.
Well No. 5, special test. T 4-1381.
Mudding approved.

SECTION 13.

Doheny-Pacific Petroleum Co.—Continued.
Well No. 2, redrill. P 4-1082.
Consideration withheld pending receipt of signed copies of log.
Well No. 2, shut off. T 4-1040.
Approval withheld pending receipt of signed copies of log.
Well No. 2, redrill. P 4-1153.
Proposal approved with reservations.
Well No. 6, drill. P 4-1368.
Proposal answered with recommendation as to point of shut-off.

SECTION 14.

Potter Oil Company.
Well No. "C," abandon. P 4-620.
Proposal answered with specifications.
Well No. "C," supplementary, abandon. P 4-682.
Proposal approved.
Well No. 5, drill. P 4-1244.
Proposal approved.
Well No. 6, drill. P 4-1163.
Proposal approved.
Well No. 6, shut off. T 4-1117.
Test inconclusive; passed for production test.
Well No. 7, drill. P 4-1243.
Proposal approved.
Well No. 7, shut off. T 4-1213.
Shut-off approved.
Well No. 8, drill. P 4-1080.
Proposal approved.
Well No. 8, shut off. T 4-1088.
Test inconclusive; additional test recommended.
Well No. 8, shut off. T 4-1098.
Shut-off approved. Tested through 985′ 8¼″ 28-lb. casing with one joint screen casing on bottom.
Well No. 9, drill. P 4-935.
Proposal approved.
Well No. 9, shut off. T 4-890.
Test inconclusive; passed for production test.
Well No. 9, production test. T 4-1004.
Shut-off approved.
Well No. 10, drill. P 4-797.
Proposal approved.
Well No. 10, shut off. T 4-816.
Passed for production test.
Well No. 10, production test. T 4-1003.
Shut-off approved.
Well No. 11, drill. P 4-934.
Proposal approved.
Well No. 11, shut off. T 4-1001.
Shut-off approved.
Well No. 12, drill. P 4-798.
Proposal approved.
Well No. 12, shut off. T 4-882.
Shut-off approved.
General Petroleum Corporation.
Well No. 16, redrill. P 4-1048.
Proposal approved.

Manley & McGinn.
  Well No. 3-C, redrill. P 4-1448.
    Decision withheld pending result of bailing test.
  Well No. 3-C, special test. T 4-1385.
    Test showed casing collapsed. Further work recommended.
  Well No. 5-C, redrill. P 4-1254.
    Proposal approved conditionally.
  Well No. 9-C, shut off. T 4-550.
    Decision withheld pending result of pumping test.
  Well No. 9-C, shut off. T 4-666.
    Shut-off approved.
  Well No. 9-C, redrill. P 4-1452.
    Proposal approved with recommendations.
  Well No. 10-C, drill. P 4-657.
    Proposal approved.
  Well No. 10-C, shut off. T 4-743.
    Shut-off approved.
  Well No. 11-C, drill. P 4-821.
    Proposal approved.
  Well No. 11-C, shut off. T 4-844.
    Shut-off approved.
  Well No. 12-C, drill. P 4-1025.
    Proposal approved.
  Well No. 12-C, shut off. T 4-997.
    Test inconclusive. Passed for production test.
  Well No. 12-C, shut off. T 4-1124.
    Production test showed shut-off satisfactory.
  Well No. 13-C, drill. P 4-1183.
    Proposal approved.
  Well No. 13-C, shut off. T 4-1161.
    Passed for production test.

SECTION 15.

Southern Pacific Company, Fuel Oil Department.
  Well No. 34, drill. P 4-1439.
    Proposal answered recommending change in point of shut-off.
  Well No. 35, drill. P 4-1441.
    Proposal answered with recommendations as to point of shut-off.
  Well No. 37, drill. P 4-1442.
    Recommended change in point of shut-off.
  Well No. 38, drill. P 4-1443.
    Recommended change in point of shut-off.
  Well No. 39, drill. P 4-1445.
    Recommended change in point of shut-off.
  Well No. 40, drill. P 4-1433.
    Proposal approved.
  Well No. 41, drill. P 4-1435.
    Recommended change in point of shut-off.
  Well No. 45, drill. P 4-1434.
    Proposal approved.
  Well No. 46, drill. P 4-1436.
    Proposal approved.
  Well No. 47, drill. P 4-1437.
    Proposal approved.
  Well No. 48, drill. P 4-1438.
    Proposal approved.

Potter Oil Company.
  Well No. 27, drill. DD-911.
    Proposal approved.

Potter Oil Co.—Continued.
  Well No. 27, shut off. T 4-631.
    Shut-off approved.

Midway Peerless Oil Company.
  Well No. 6, redrill. P 4-601.
    Proposal approved.
  Well No. 12, redrill. P 4-817.
    Proposal approved.
  Well No. 15, shut off. T 4-532.
    Shut-off approved.
  Water well, drill. P 4-877.
    Proposal approved.

Manley & McGinn.
  Well No. 5, redrill. P 4-1175.
    Proposal approved conditionally.
  Well No. 6, drill. P 4-517.
    Proposal approved.

SECTION 21.

State Consolidated Oil Company.
  Well No. 5, shut off. T 4-529.
    New shut-off recommended.
  Well No. 5, shut off. T 4-737.
    Shut-off rejected.
  Well No. 5, shut off. T 4-1223.
    Approval withheld pending receipt of records.

SECTION 22.

C. C. M. O. Co. (Chanslor-Canfield-Midway Oil Company).
  Well No. 1, deepen. P 4-970.
    Proposal approved conditionally.
  Well No. 3, alter casing. P 4-1186.
    Proposal approved.

SECTION 23.

Tumbador Oil Company.
  Well No. 14, drill. P 4-611.
    Proposal approved.

Rock Oil Company.
  Well No. 1, special test. T 4-673.
    Fluid level determined.
  Well No. 2, special test. T 4-558.
    Fluid level determined.
  Well No. 2, special test. T 4-608.
    Fluid level determined.
  Well No. 2, shut off. D-935.
    Test inconclusive.
  Well No. 4, special test. T 4-557.
    Fluid level determined with tubing in hole.
  Well No. 4, special test. T 4-836.
    Fluid level determined.
  Well No. 7, special test. T 4-682.
    Fluid level determined.
  Well No. 8, special test. T 4-586.
    Fluid level determined.

SECTION 24.

Brookshire Oil Company.
  Well No. 5, special test. T 4-513.
    Fluid level determined.
  Well No. 7, special test. T 4-570.
    Fluid level determined.

SECTION 25.

Visalia Midway Oil Company.
  Well No. 4, deepen. P 4-663.
    Proposal rejected; recommended that company submit new proposal.
  Well No. 4, deepen. P 4-719.
    Proposal approved conditionally.
  Well No. 6, shut off. T 4-650.
    Test unsatisfactory.
  Well No. 6, plug. P 4-731.
    Proposal approved.
  Well No. 7, special test. T 4-785.
    Fluid level and depth of hole determined.

Recovery Oil Company.
  Well No. 7, drill. P 4-1405.
    Proposal approved conditionally.
  Well No. 7, shut off. T 4-1383.
    Shut-off approved.

American Oilfields Company.
  Well No. 1, special test. T 4-627.
    Fluid level determined.
  Well No. 2, special test. T 4-626.
    Fluid level determined.

SECTION 26.

State Consolidated Oil Company.
  Well No. 16, drill. P 4-738.
    Proposal approved conditionally.
  Well No. 16, shut off. T 4-1020.
    Shut-off approved conditionally.
  Well No. 17, drill. P 4-1139.
    Recommended change in point of shut-off.

Reward Oil Company.
  Well No. 2, redrill. P 4-583.
    Proposal approved.
  Well No. 4, shut off. T 4-801.
    Shut-off rejected.
  Well No. 4, shut off. T 4-930.
    Approval withheld.
  Well No. 5, drill. P 4-600.
    Proposal approved.
  Well No. 5, shut off. T 4-732.
    Approval withheld.
  Well No. 6, shut off. T 4-902.
    Decision withheld.
  Well No. 6, shut off. T 4-1005.
    Decision withheld.
  Well No. 7, shut off. T 4-1085.
    Decision withheld.
  Well No. 7, shut off. T 4-1148.
    Test inconclusive.
  Well No. 7, shut off. T 4-1150
    Shut-off rejected.
  Well No. 7, special test. T 4-1187.
    Fluid level determined.
  Well No. 7, shut off. T 4-1214.
    Shut-off rejected.
  Well No. 7, special test. T 4-1232.
    Fluid level determined.
  Well No. 8, drill. P 4-1173.
    Approval withheld.

Reward Oil Co.—Continued.
  Well No. 8, shut off. T 4-1110.
    Decision withheld.
  Well No. 8, shut off. T 4-1202.
    Decision withheld.
  Well No. 8, shut off. T 4-1205.
    Decision withheld.
  Well No. 8, special test. T 4-1278.
    Witnessed hole being cleaned out.
  Well No. 8, redrill. P 4-1447.
    Proposal answered, with recommendations.
  Well No. 9, drill. P 4-1174.
    Consideration withheld, pending receipt of elevation of well.
  Well No. 9, shut off. T 4-1272.
    Decision withheld.
  Well No. 9, shut off. T 4-1320.
    Test inconclusive.
  Well No. 9, shut off. T 4-1322.
    Test inconclusive.
  Well No. 9, shut off. T 4-1323.
    Test inconclusive; another test recommended.
  Well No. 9, shut off. T 4-1334.
    Test inconclusive; another test recommended.
  Well No. 9, shut off. T 4-1346.
    Decision withheld.

Pyramid Oil Co.
  Well No. 1, abandon. P 4-750.
    Proposal answered, with complete specifications for abandonment.
  Well No. 1, special test. T 4-741.
    Test resulted in modification of method of abandonment.
  Well No. 1, special test. T 4-758.
    Fluid level determined and mudding witnessed.
  Well No. 1, special test. T 4-763.
    Test to determine result of mudding.
  Well No. 1, special test. T 4-794.
    Mudding approved.
  Well No. 1, special test. T 4-837.
    Plugging approved.
  Well No. 1, special test. T 4-840.
    Plugging approved.
  Well No. 1, special test. T 4-849.
    Plugging approved.
  Well No. 1, special test. T 4-850.
    Mudding approved.
  Well No. 1, special test. T 4-859.
    Plugging approved.
  Well No. 3, abandoned. P 4-724.
    Proposal answered, with complete specifications for abandonment.
  Well No. 3, special test. T 4-706.
    Fluid level and depth of hole determined.
  Well No. 12, drill. P 4-1157.
    Proposal approved.
  Well No. 12, shut off. T 4-1087.
    Test inconclusive.
  Well No. 12, shut off. T 4-1093.
    Shut-off approved.
  Well No. 13, drill. P 4-985.
    Proposal answered, with recommendations.

Pyramid Oil Co.—Continued.
  Well No. 13, shut off. T 4-940.
    Shut-off approved.
  Well No. 14, drill. P 4-1326.
    Proposal approved, conditionally.
  Well No. 14, shut off. T 4-1296.
    Shut-off approved.

Mocal Oil Co.
  Well No. 6, drill. P 4-732.
    Proposal approved, conditionally.
  Well No. 6, shut off. T 4-795.
    Shut-off approved.
  Well No. 6, redrill. P 4-1468.
    Proposal approved.
  Well No. 7, drill. P 4-1130.
    Proposal approved.
  Well No. 7, shut off. T 4-1157.
    Shut-off approved.
  Well No. 8, drill. P 4-1257.
    Proposal approved, conditionally.
  Well No. 8, shut off. T 4-1221.
    Shut-off approved.

General Petroleum Corporation.
  Well No. 4, special test. T 4-556.
    Fluid level determined.

El Camino Oil and Development Co.
  Well No. 23, drill. P 4-811.
    Proposal approved, conditionally.
  Well No. 23, shut off. T 4-830.
    Proposal approved.
  Well No. 24, drill. P 4-666.
    Proposal approved.
  Well No. 24, shut off. RT 4-720.
    Shut-off approved.

Jos. B. Dabney Oil Co.
  Well No. 8, abandon. P 4-1488.
    Reported work done without the notice to this department. Approval withheld.
  Well No. 9, drill. P 4-1432.
    Proposal rejected, pending receipt of signed copies of log.
  Well No. 9, drill. P 4-1483.
    Approved, conditionally.

Combined Oil Co.
  Well No. 1, shut off. T 4-841.
    Decision withheld.
  Well No. 1, shut off. T 4-919.
    Approval withheld, pending investigation of territory.
  Well No. 2, drill. P 4-1132.
    Proposal approved.
  Well No. 2, shut off. T 4-1142.
    Decision withheld, pending investigation of territory.
  Well No. 2, shut off. T 4-1201.
    Test inconclusive.
  Well No. 2, shut off. T 4-1207.
    Decision withheld, pending investigation of this territory
  Well No. 3, drill. P 4-1424.
    Proposal approved.

Chanslor-Canfield Midway Oil Co.
  Well No. 3, shut off. T-549.
    Shut-off approved.
  Well No. 3, redrill. P 4-803.
    Proposal approved.
  Well No. 7, shut off. T 4-510.
    Shut-off approved.
  Well No. 9, shut off. T 4-567.
    Passed for pumping test.
  Well No. 9, production test. T 4-755.
    Decision deferred.
  Well No. 10, shut off. T 4-829.
    Shut-off approved.
  Well No. 11, shut off. T 4-691.
    Shut-off approved.
  Well No. 12, shut off. T 4-643.
    Shut-off approved.
  Well No. 13, shut off. T 4-978.
    Passed for production test.
  Well No. 14, shut off. T 4-916.
    Shut-off approved.
  Well No. 15, shut off. T 4-664.
    Shut-off approved.
  Well No. 16, deepen. P 4-713.
    Proposal approved, with recommendations.
  Well No. 16, redrill. P 4-1114.
    Proposal approved, with recommendations.
  Well No. 17, abandon. P 4-617.
    Proposal approved.
  Well No. 17, redrill. P 4-733.
    Proposal approved, with recommendations.
  Well No. 17, abandon. P 4-843.
    Proposal approved.
  Well No. 17-A, drill. P 4-883.
    Proposal approved, with recommendations.
  Well No. 17-A, shut off. T 4-895.
    Shut-off approved.
  Well No. 18, shut off. T 4-652.
    Passed for production test.
  Well No. 19, shut off. T 4-548.
    Passed for production test.
  Well No. 19, shut off. T 4-964.
    Shut-off rejected, with recommendations.
  Well No. 20, shut off. T 4-615.
    Passed for production test.
  Well No. 20, production test. T 4-1122.
    Decision withheld.
  Well No. 21, shut off. T 4-776.
    Passed for production test.
  Well No. 21, production test. T 4-1123.
    Decision withheld.
  Well No. 22, shut off. T 4-748.
    Shut-off approved.
California Star Oil Co.
  Well No. 1, redrill. P 4-1074.
    Decision withheld, pending pumping test.
  Well No. 4, redrill. P 4-716.
    Proposal approved.

California Star Oil Co.—Continued.
  Well No. 5, redrill. DD-912.
    Proposal approved.
  Well No. 6, redrill. P 4-752.
    Proposal approved.
  Well No. 7, redrill. P 4-737.
    Proposal approved.
  Well No. 8, redrill. P 4-771.
    Proposal approved, conditionally.
  Well No. 8, redrill. P 4-1112.
    Proposal approved.
  Well No. 9, redrill. P 4-1043.
    Proposal approved.
  Well No. 9, shut off. T 4-1127.
    Proposal approved.
  Well No. 9, redrill. P 4-1492.
    Proposal approved.

A. & J. Oil Co.
  Well No. 4, redrill. P 4-1250.
    Proposal approved, conditionally.
  Well No. 5, redrill. P 4-1041.
    Consideration withheld, pending receipt of signed copies of log.
  Well No. 5, redrill. P 4-1052.
    Proposal approved.

Section 27.

International Oil Co.
  Well No. 1, abandon. P 4-1282.
    Decision withheld, pending bailing test.
  Well No. 1, shut off. T 4-1219.
    Shut-off approved.

Chanslor-Canfield Midway Oil Co.
  Well No. 7, drill. P 4-971.
    Proposal approved.
  Well No. 7, shut off. T 4-1055.
    Shut-off approved.
  Well No. 8, drill. P 4-919.
    Proposal approved.
  Well No. 8, shut off. T 4-900.
    Shut-off approved.
  Well No. 9, drill. P 4-802.
    Proposal approved, conditionally.
  Well No. 9, shut off. T 4-833.
    Shut-off approved.
  Well No. 10, drill. P 4-1090.
    Proposal approved.
  Well No. 10, shut off. T 4-1017.
    Shut-off approved.
  Well No. 11, drill. P 4-1320.
    Proposal approved.
  Well No. 11, shut off. P 4-1289.
    Test inconclusive.
  Well No. 12, drill. P 4-1272.
    Proposal approved.
  Well No. 12, shut off. T 4-1254.
    Shut-off approved.
  Well No. 13, drill. P 4-1349.
    Proposal approved.

- Chanslor-Canfield Midway Oil Co.—Continued.
  - Well No. 13, shut off. T 4-1318.
    - Shut-off approved.
  - Well No. 14, drill. P 4-1451.
    - Proposal approved.
  - Well No. 16, drill. P 4-1469.
    - Proposal approved.

SECTION 35.

- Chanslor-Canfield Midway Oil Co.
  - Well No. 13, shut off. T 4-661.
    - Shut-off approved.
  - Well No. 13, special test. T 4-707.
    - Test indicated no water or productive oil sands present.
  - Well No. 13, abandon. P 4-755.
    - Proposal answered, with specifications.
- Associated Oil Co.
  - Well No. 23, redrill. P 4-950.
    - Proposal approved.

SECTION 36.

- Chanslor-Canfield Midway Oil Co.
  - Well No. 17, deepen. P 4-629.
    - Proposal approved.
  - Well No. 17, special test. T 4-778.
    - Cementing approved.
  - Well No. 17, shut off. T 4-846.
    - Shut-off approved.
  - Well No. 26, redrill. P 4-801.
    - Proposal approved.
  - Well No. 26, shut off. T 4-759.
    - Approval withheld, pending receipt of proper records.
  - Well No. 26, supplementary redrill. P 4-845.
    - Proposal approved.
  - Well No. 26, shut off. T 4-817.
    - Shut-off approved.
  - Well No. 29, shut off. T 4-610.
    - Shut-off approved.
  - Well No. 33, shut off. T 4-547.
    - Shut-off approved.
  - Well No. 34, supplementary drill. P 4-690.
    - Proposal approved, conditionally.
  - Well No. 34, supplementary redrill. P 4-691.
    - Proposal approved.
  - Well No. 34, shut off. P 4-693.
    - Shut-off approved.
- American Oilfields Co.
  - Well No. 5, redrill. P 4-794.
    - Proposal approved.
  - Well No. 33, redrill. P 4-587.
    - Proposal answered, with recommendations.
  - Well No. 33, shut off. T 4-734.
    - Approval withheld.
  - Well No. 33, deepen. P 4-1058.
    - Proposal approved, conditionally.
  - Well No. 33, deepen. P 4-1164.
    - Proposal approved, conditionally.
  - Well No. 33, redrill. P 4-1233.
    - Proposal approved, with recommendations.

American Oilfields Co.—Continued.
Well No. 43, redrill. P 4-795.
Proposal approved.
Well No. 55, redrill. P 4-1028.
Proposal rejected.
Well No. 55, redrill. P 4-1420.
Proposal approved.
Well No. 57, redrill. P 4-1002.
Proposal approved.
Well No. 75, deepen. P 4-710.
Proposal approved.
Well No. 76, redrill and deepen. P 4-1201.
Proposal approved, conditionally.
Well No. 92, deepen. P 4-1102.
Approval withheld.
Well No. 98, redrill. P 4-874.
Proposal approved.
Well No. 101, deepen. P 4-806.
Proposal approved, conditionally.

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SECTION 19.

Calidon Petroleum Syndicate.
Well No. 2, redrill. P 4-1115.
Proposal approved.
Well No. 3, shut off. D-926.
Shut-off approved.
Union Oil Company of California.
Well No. 3, "Midway Royal," shut off. T 4-684.
Decision withheld, pending developments.
Well No. 3, "Midway Royal," supplementary drill. P 4-1129.
Proposal approved.
Well No. 3, "Midway Royal," shut off. T 4-1165.
Shut-off approved.
Well No. 3, "Midway Royal," abandon. P 4-1491.
Proposal approved, with recommendations.

SECTION 20.

United Oil Co.
Well No. 20, shut off. T 4-692.
Decision withheld.
Well No. 20, shut off. T 4-705.
Test inconclusive.

SECTION 22.

Standard Oil Co.
Well No. 6, redrill. P 4-1301.
Proposal approved, conditionally.

SECTION 25.

Southern Pacific Company, Fuel Oil Department.
Well No. 14, shut off. T 4-579.
Test inconclusive.
Well No. 15, shut off. T 4-746.
Shut-off approved.
Well No. 15, supplementary drill. P 4-809.
Proposal approved.
Well No. 17, drill. P 4-707.
Proposal approved.

Southern Pacific Co., Fuel Oil Department—Continued.
Well No. 19, drill. P 4-706.
Proposal approved.
Well No. 21, drill. P 4-692.
Proposal approved.
Well No. 21, shut-off. T 4-708.
Shut-off approved.
Well No. 28, redrill. P 4-1462.
Proposal approved.

SECTION 26.

Standard Oil Co.
Well No. 2, deepen. P 4-1169.
Proposal approved.
Well No. 13, deepen. P 4-537.
Proposal approved.
Well No. 18, shut-off. T 4-1084.
Shut-off approved.

SECTION 27.

Southern Pacific Company, Fuel Oil Department.
Well No. 5, drill. P 4-893.
Proposal approved.
Well No. 31, shut-off. T 4-1015.
Shut-off approved.

Midway Gas Co.
Well No. 27, shut-off. T 4-726.
Shut-off approved.
Well No. 59, drill. P 4-1345.
Proposal approved.

SECTION 28.

Consolidated Mutual Oil Co.
Well No. 15, drill. P 4-1071.
Proposal approved.

SECTION 30.

Associated Oil Co.
Well No. 2, redrill. P 4-534.
Proposal approved conditionally.
Well No. 2, supplementary redrill. P 4-946.
Proposal approved.
Well No. 2, supplementary abandon. P 4-1045.
Proposal answered with specifications for abandonment.

Consolidated Mutual Oil Co.
Well No. 6, deepen. P 4-1248.
Proposal approved.
Well No. 6, shut-off. T 4-1179.
Test inconclusive.
Well No. 6, shut off. T 4-1195.
Test satisfactory.
Well No. 6, special test. T 4-1210.
Test inconclusive.
Well No. 6, special test. T 4-1220.
Shut-off approved conditionally.

SECTION 31.

Standard Oil Co., "Eagle Creek."
Well No. 4, redrill. P 4-1284.
Proposal approved conditionally.

Standard Oil Co., "Eagle Creek"—Continued.
  Well No. 5, redrill. P 4-918.
    Proposal approved.
  Well No. 5, supplementary redrill. P 4-1055.
    Proposal approved conditionally.
  Well No. 11, redrill. P 4-1140.
    Proposal answered with recommendations.
  Well No. 11, redrill. P 4-1453.
    Proposal answered with recommendations.
  Well No. 11, special test. T 4-1372.
    Shoe of 8¼" casing located.
  Well No. 13, redrill. P 4-1270.
    Proposal approved conditionally.
  Well No. 19, redrill. P 4-1322.
    Proposal approved.
  Well No. 19, shut off. T 4-1340.
    Fluid level determined.
  Well No. 19, shut off. T 4-1341.
    Passed for production test.
  Well No. 20, shut off. T 4-611.
    Shut-off approved.
  Well No. 21, abandon. P 4-830.
    Proposal answered with specifications for abandonment.
  Well No. 22, shut off. T 4-562.
    Decision withheld.
  Well No. 22, shut off. T 4-660.
    Passed for production test.
  Well No. 23, drill. P 4-581.
    Proposal approved.
  Well No. 23, shut off. P 4-633.
    Shut-off approved.
  Well No. 24, drill. P 4-725.
    Proposal approved.
  Well No. 25, drill. P 4-726.
    Proposal approved.
  Well No. 25, shut off. T 4-774.
    Shut-off approved.
  Well No. 26, drill. P 4-671.
    Proposal approved.
  Well No. 26, shut off. T 4-733.
    Shut-off approved.
  Well No. 28, drill. P 4-936.
    Proposal approved.
  Well No. 28, shut off. T 4-904.
    Shut-off approved.
  Well No. 29, drill. P 4-1026.
    Proposal approved.
  Well No. 29, shut off. T 4-1194.
    Shut-off approved.
Eight Oil Co.
  Well No. 4, abandon. P 4-834.
    Proposal rejected.
  Well No. 4, supplementary abandon. P 4-1411.
    Proposal answered with specifications.
  Well No. 5, abandon. P 4-835.
    Proposal rejected.

Eight Oil Co.—Continued.
  Well No. 5, supplementary abandon. P 4-1412.
    Proposal answered with specifications.
  Well No. 8, abandon. P 4-836.
    Proposal rejected.
  Well No. 8, supplementary abandon. P 4-1406.
    Proposal answered with specifications.
  Well No. 9, abandon. P 4-837.
    Proposal rejected.
  Well No. 16, abandon. P 4-838.
    Proposal rejected.
  Well No. 18, abandon. P 4-839.
    Proposal rejected with recommendations.
  Well No. 18, supplementary abandon. P 4-892.
    Acknowledged receipt of notice that well would not be abandoned.

Chanslor-Canfield Midway Oil Co.
  Well No. 9, redrill. P 4-573.
    Proposal approved.
  Well No. 20, abandon. P 4-776.
    Proposal answered with recommendations.
  Well No. 21, shut off. T 4-522.
    Shut-off approved.
  Well No. 25, shut off. T 4-524.
    Shut-off approved.
  Well No. 28, shut off. T 4-507.
    Shut-off approved.
  Well No. 29, redrill. P 4-1465.
    Proposal approved with recommendations.
  Well No. 31, redrill. P 4-754.
    Proposal approved.

SECTION 32.

California Midway Oil Co.
  Well No. 10, shut off. T 4-808.
    Passed for production test.
  Well No. 10, production test. T 4-984.
    Condition unsatisfactory.
  Well No. 10, deepen. P 4-1214.
    Proposal approved.

Alaska Pioneer Oil Co.
  Well No. 8, shut off. T 4-506.
    Further work recommended.
  Well No. 8, deepen. P 4-593.
    Proposal approved.
  Well No. 8, shut off. T 4-623.
    Shut-off approved.
  Well No. 8, shut-off. T 4-657.
    Test showed no productive oil measures in hole below 6¼".
  Well No. 8, supplementary deepen. P 4-1215.
    Proposal approved.
  Well No. 8, shut off. T 4-1335.
    Shut-off approved.

General Petroleum Corporation.
  Well No. 6, abandon. P 4-990.
    Proposal answered with specifications.
  Well No. 6, supplementary abandon. P 4-1038.
    Proposal answered with additional specifications.

SECTION 34.

Union Oil Company of California.
Well No. 7, abandon. P 4-756.
Proposal answered with specifications.
Well No. 7, revised proposal to abandon. P 4-783.
Proposal approved.
Well No. 9, abandon. P 4-1042.
Proposal rejected.

SECTION 35.

Southern Pacific Co., Fuel Oil Department.
Well No. 6, redrill. P 4-744.
Proposal approved.
Well No. 6, supplementary redrill. P 4-856.
Proposal revoked.
Well No. 6, shut off. T 4-824.
Shut-off approved.
Well No. 54, drill. P 4-693.
Proposal approved.
Well No. 54, shut off. T 4-749.
Shut-off approved.
Well No. 54, deepen. P 4-1156.
Proposal approved.
Well No. 54, deepen. P 4-1224.
Proposal approved conditionally.
Well No. 56, drill. P 4-694.
Proposal approved.
Well No. 56, shut off. T 4-1104.
Shut-off approved.
Well No. 57, drill. P 4-695.
Proposal approved.
Well No. 57, shut off. T 4-798.
Shut-off approved.
Well No. 58, drill. P 4-696.
Proposal approved.
Well No. 58, shut off. T 4-954.
Test unsatisfactory.
Well No. 58, shut off. T 4-955.
Shut-off approved.
Well No. 60, drill. P 4-697.
Proposal approved.
Well No. 60, shut off. T 4-927.
Decision withheld.
Well No. 61, drill. P 4-698.
Proposal approved.
Well No. 61, shut-off. T 4-1306.
Shut-off approved.

SECTION 36.

Standard Oil Co.
Well No. 11, redrill. P 4-1470.
Approved conditionally.
Well No. 11, shut off. T 4-1380.
Shut-off satisfactory.
Well No. 14, supplementary redrill. P 4-823.
Proposal approved with recommendations.
Well No. 14, shut off. T 4-947.
Decision withheld, pending additional tests.

Standard Oil Co.—Continued.
  Well No. 14, shut off. T 4-949.
    Decision withheld pending receipt of records.
  Well No. 14, shut off. T 4-995.
    Shut-off approved conditionally.
  Well No. 25, shut off. T 4-559.
    Shut-off approved.
  Well No. 27, redrill. P 4-824.
    Proposal approved conditionally.
  Well No. 27, shut off. T 4-847.
    Shut-off approved.
  Well No. 27, supplementary deepen. P 4-1004.
    Proposal approved conditionally.
  Well No. 29, redrill. P 4-1314.
    Proposal approved conditionally.
  Well No. 43, redrill. P 4-1313.
    Proposal approved.
  Well No. 44, redrill. P 4-1091.
    Proposal approved conditionally.
  Well No. 44, shut off. T 4-1031.
    Shut-off approved with recommendations.
  Well No. 44, supplementary redrill. P 4-1198.
    Proposal approved, with recommendations.
  Well No. 44, shut off. T 4-1283.
    Test inconclusive.
  Well No. 44, shut off. T 4-1284.
    Shut-off unsatisfactory.
  Well No. 44, supplementary redrill. P 4-1419.
    Proposal approved conditionally.
  Well No. 48, deepen. P 4-1138.
    Proposal approved conditionally.
  Well No. 49, deepen. P 4-1171.
    Proposal approved, conditionally.
  Well No. 52, deepen. DD-909.
    Proposal approved.
  Well No. 52, redrill. P 4-818.
    Proposal approved.
  Well No. 52, shut off. T 4-1066.
    Test inconclusive.
  Well No. 52, shut off. T 4-1077.
    Shut-off approved.
  Well No. 52, redrill. P 4-1400.
    Decision withheld pending receipt of records.
  Well No. 52, redrill. P 4-1444.
    Proposal approved, with recommendations.
  Well No. 55, redrill. P 4-579.
    Proposal approved.
  Well No. 55, shut off. T 4-685.
    Passed for production test.
  Well No. 55, deepen. P 4-1155.
    Proposal approved, conditionally.
  Well No. 55, redrill. P 4-1401.
    Decision withheld, pending receipt of data.
  Well No. 55, redrill. P 4-1446.
    Proposal rejected.
  Well No. 55, supplementary redrill. P 4-1481.
    Proposal answered, with recommendations.

The Petroleum Co.—Continued.
  Well No. 56, redrill. P 4-872.
    Decision withheld, pending receipt of signed copies of log.
  Well No. 56, supplementary redrill. P 4-914.
    Proposal answered, with recommendations.
  Well No. 57, shut off. T 4-592.
    Shut-off approved.
  Well No. 58, drill. P 4-596.
    Proposal answered, recommendations.
  Well No. 58, shut off. T 4-687.
    Shut-off approved.
  Well No. 59, drill. P 4-652.
    Proposal approved.
  Well No. 59, shut off. T 4-760.
    Test inconclusive.
  Well No. 59, shut off. T 4-764.
    Shut-off approved.
  Well No. 60, drill. P 4-658.
    Proposal approved.
  Well No. 60, shut off. T 4-754.
    Shut-off approved.
  Well No. 60, redrill. P 4-1089.
    Decision withheld, pending receipt of records.
  Well No. 60, supplementary redrill. P 4-1137.
    Proposal approved.
  Well No. 61, drill. P 4-1123.
    Proposal approved.
  Well No. 61, shut off. T 4-1248.
    Passed for production test.
  Well No. 62, drill. P 4-1122.
    Proposal approved.
  Well No. 62, supplementary drill. P 4-1303.
    Proposal approved.
  Well No. 62, shut off. T 4-1273.
    Shut-off approved.
  Well No. 62, redrill. P 4-1430.
    Proposal approved.

T. 31 S., R. 24 E., M.D.B. & M.

SECTION 31.

Southern Pacific Company, Fuel Oil Department.
  Well No. 8, drill. P 4-515.
    Proposal approved.
  Well No. 8, shut off. T 4-809.
    Shut-off approved.
  Well No. 8, redrill. P 4-1237.
    Proposal approved.
  Well No. 59, drill. P 4-1431.
    Proposal answered, with recommendations.

T. 32 S., R. 23 E., M.D.B. & M.

SECTION 1.

Southern Pacific Company, Fuel Oil Department.
  Well No. 1, deepen. P 4-813.
    Proposal approved.
  Well No. 41, shut off. T 4-638.
    Shut-off approved.
  Well No. 41, redrill. P 4-1152.
    Decision withheld, pending receipt of signed copies of log.

Southern Pacific Co., Fuel Oil Department—Continued.
  Well No. 41, redrill. P 4-1200.
    Proposal approved.
  Well No. 56, shut off. T 4-625.
    Shut-off approved.
  Well No. 57, shut off. D-933.
    Shut-off approved.
  Well No. 58, shut off. T 4-542.
    Shut-off approved.

SECTION 2.

North American Oil Consolidated.
  Well No. 9, redrill. P 4-1057.
    Proposal approved, conditionally.
  Well No. 9, shut off. T 4-1025.
    Shut-off approved.
  Well No. 10, shut off. T 4-583.
    Shut-off approved.
  Well No. 14, redrill. P 4-1363.
    Proposal approved, conditionally.
  Well No. 14, supplementary redrill. P 4-1428.
    Proposal approved.
  Well No. 15, drill. P 4-1367.
    Proposal answered, with recommendations.
  Well No. 15, shut off. T 4-1360.
    Shut-off approved, conditionally.

SECTION 3.

Southern Pacific Company, Fuel Oil Department.
  Well No. 6, drill. P 4-799.
    Proposal approved.

SECTION 4.

Standard Oil Company, "Equitable."
  Well No. 10, drill. P 4-639.
    Proposal approved.
  Well No. 10. P 4-997.
    Proposal approved.
  Well No. 10 (new), drill. P 4-998.
    Proposal approved.
  Well No. 10, shut off. T 4-1038.
    Shut-off approved.
  Well No. 11, drill. P 4-810.
    Proposal approved, conditionally.
  Well No. 11, shut off. T 4-892.
    Shut-off approved.
  Well No. 11, redrill. P 4-1307.
    Proposal approved, conditionally.
  Well No. 12, drill. P 4-1457.
    Proposal answered, with recommendations as to point of shut-off.
General Petroleum Corporation.
  Well No. 3, redrill. P 4-1285.
    Proposal approved, conditionally.
  Well No. 3, supplementary redrill. P 4-1417.
    Proposal approved, conditionally.
  Well No. 5, redrill. P 4-1479.
    Proposal approved.

SECTION 5.

St. Lawrence Oil Co.
  Well No. 6, abandon. P 4-1458.
    Proposal answered, with specifications.
  Well No. 8, redrill. P 4-559.
    Proposal approved.

Southern Pacific Company, Fuel Oil Department
  Well No. 6, deepen. P 4-1415.
    Proposal approved.
  Well No. 31, drill. P 4-955.
    Proposal approved.
  Well No. 31, shut off. T 4-994.
    Shut-off approved.
  Well No. 32, drill. P 4-953.
    Proposal approved.
  Well No. 32, shut off. T 4-1016.
    Shut-off approved.
  Well No. 33, drill. P 4-954.
    Proposal approved.
  Well No. 33, shut off. T 4-1185.
    Shut-off approved.
  Well No. 34, drill. P 4-956.
    Proposal approved.
  Well No. 34, shut off. T 4-1233.
    Shut-off approved.
  Well No. 35, drill. P 4-957.
    Proposal approved.
  Well No. 35, shut off. T 4-1307.
    Test inconclusive.
  Well No. 35, shut off. T 4-1327.
    Decision deferred.
  Well No. 36, drill. P 4-958.
    Proposal approved.
  Well No. 37, drill. P 4-959.
    Proposal approved.
  Well No. 37, shut off. T 4-1178.
    Shut-off approved.
  Well No. 37, supplementary drill. P 4-1364.
    Proposal approved.
  Well No. 37, shut off. T 4-1310.
    Shut-off approved.

Midway Five Oil Co.
  Well No. 1, abandon. P 4-614.
    Proposal answered, with specifications.

SECTION 6.

Chanslor-Canfield Midway Oil Co.
  Well No. 16, redrill. P 4-1274.
    Proposal approved.
  Well No. 40, redrill. P 4-1158.
    Proposal answered, with recommendations.
  Well No. 40, shut off. T 4-1105.
    Shut-off approved.
  Well No. 48, redrill. P 4-917.
    Proposal approved.
  Well No. 54, shut off. T 4-600.
    Shut-off approved.
  Well No. 54, redrill. P 4-728.
    Proposal approved.

Chanslor-Canfield Midway Oil Co.—Continued.
  Well No. 55, shut off. T 4-690.
    Shut-off approved.
  Well No. 57, shut off. T 4-537.
    Shut-off approved.
  Well No. 62, shut off. D-934.
    Shut-off approved.

United Oil Co.
  Well No. 6, shut off. T 4-531.
    Shut-off approved.
  Well No. 6, shut off. T 4-588.
    Passed for pumping test.
  Well No. 6, alter casing. P 4-643.
    Proposal approved.
  Well No. 6, shut off. T 4-644.
    Approval withheld.
  Well No. 6, production test. T 4-941.
    Condition unsatisfactory; recommended tests to locate source of water.
  Well No. 10, drill. P 4-1181.
    Proposal approved, conditionally.
  Well No. 10, shut off. T 4-1226.
    Shut-off satisfactory.
  Well No. 10, shut off. T 4-1227.
    Shut-off satisfactory.
  Well No. 10, special test. T 4-1270.
    Sand tested carried no water.
  Well No. 10, special test. T 4-1271.
    Strata tested not water-bearing.
  Well No. 10, production test. T 4-1345.
    Condition unsatisfactory.
  Well No. 10, production test. T 4-1358.
    Condition unsatisfactory.

SECTION 7.

Stratton Water Co.
  Well No. 2, abandon. P 4-1083.
    Proposal answered, with specifications.
  Well No. 3, abandon. P 4-1084.
    Proposal answered, with specifications.
  Well No. 4, abandon. P 4-1085.
    Proposal answered, with specifications.
  Well No. 5, abandon. P 4-717.
    Proposal answered, with specifications.
  Well No. 5, special test. T 4-871.
    Mudding rejected.
  Well No. 5, special test. T 4-901.
    Mudding approved.
  Well No. 5, special test. T 4-956.
    Shooting of well approved.
  Well No. 5, special test. T 4-957.
    Plugging approved.
  Well No. 5, shut off. T 4-958.
    Test inconclusive.
  Well No. 5, special test. T 4-965.
    Shooting approved.

SECTION 8.

Hale-McLeod Oil Co.
  Well No. 15, deepen. P 4-1097.
    Proposal approved, conditionally.

Hale-McLeod Oil Co.—Continued.
Well No. 17, redrill. P 4-820.
Proposal approved.
Well No. 20, abandon. P 4-962.
Decision withheld, pending receipt of signed copies of log.
Well No. 20, abandon. P 4-988.
Proposal approved.
Well No. 21, drill. P 4-960.
Proposal approved.
Well No. 21, shut off. T 4-899.
Shut-off approved.
Well No. 22, drill. P 4-1189.
Proposal approved.
Well No. 22, shut off. T 4-1145.
Test inconclusive.
Well No. 22, shut off. T 4-1206.
Shut-off approved.
Well No. 23, drill. P 4-1426.
Proposal approved.

Chanslor-Canfield Midway Oil Co.
Well No. 26, deepen. P 4-630.
Proposal approved, conditionally.
Well No. 26, supplementary deepen. P 4-1088.
Proposal answered, with recommendations.
Well No. 26, special test. T 4-1000.
Cementing approved.
Well No. 26, supplementary deepen. P 4-1212.
Proposal answered, with recommendations.
Well No. 26, shut off. T 4-1141.
Shut-off approved, with reservations.
Well No. 27, drill. P 4-1044.
Proposal approved.
Well No. 27, shut off. T 4-1139.
Passed for production test.
Well No. 28, drill. P 4-659.
Proposal approved.
Well No. 28, shut off. T 4-718.
Test inconclusive.
Well No. 28, production test. T 4-1125.
Shut-off approved.
Well No. 29, drill. P 4-920.
Proposal approved.
Well No. 29, shut off. T 4-922.
Test inconclusive.
Well No. 29, production test. T 4-1235.
Shut-off approved.
Well No. 30, drill. P 4-814.
Proposal approved.
Well No. 30, shut off. T 4-1218.
Shut-off approved.
Well No. 31, drill. P 4-1241.
Proposal approved.
Well No. 31, shut off. T 4-1250.
Shut-off approved.
Well No. 32, drill. P 4-1396.
Proposal approved.
Well No. 34, drill. P 4-1116.
Proposal approved.

Chanslor-Canfield Midway Oil Co.—Continued.
  Well No. 34, shut off. T 4-1113.
    Test inconclusive.
  Well No. 34, shut off. T 4-1115.
    Shut-off unsatisfactory.
  Well No. 34, supplementary drill. P 4-1257.
    Proposal approved, with recommendations.
  Well No. 34, shut off. T 4-1239.
    Shut-off approved for prospecting ahead.
  Well No. 34, supplementary drill. P 4-1299.
    Proposal approved.
  Well No. 34, shut off. T 4-1293.
    Another test recommended.
  Well No. 34, supplementary drill. P 4-1423.
    Proposal approved.
  Well No. 34, shut off. T 4-1384.
    Shut-off approved.
  Well No. 35, drill. P 4-1342.
    Proposal approved.
  Well No. 35, shut off. T 4-1370.
    Shut-off approved.
  Well No. 36, drill. P 4-1346.
    Proposal approved.
  Well No. 36, supplementary drill. P 4-1354.
    Proposal approved.
  Well No. 36, shut off. T 4-1350.
    Shut-off approved.

SECTION 9.

Chanslor-Canfield Midway Oil Co.
  Well No. 19, abandon. P 4-777.
    Proposal answered, with recommendations.
  Well No. 19, supplementary abandon. P 4-1024.
    Proposal approved, conditionally.
  Well No. 19, shut off. T 4-1095.
    Test inconclusive.
  Well No. 19. shut off. T 4-1099.
    Plugging approved.
  Well No. 19, supplementary plug. P 4-1245.
    Proposal answered, with recommendations.

SECTION 10.

Standard Oil Co.
  Well No. 6, redrill. P 4-1302.
    Proposal approved.
  Well No. 6, shut off. T 4-1304.
    Test inconclusive.
  Well No. 6, shut off. T 4-1305.
    Shut-off unsatisfactory. Recommended tests to locate source of water.
  Well No. 9, shut off. T 4-533.

Chanslor-Canfield Midway Oil Co.
  Well No. 4, alter casing. P 4-586.
    Proposal approved.
  Well No. 4, abandon. P 4-799.
    Proposal approved, with recommendations.
  Well No. 5, abandon. P 4-778.
    Proposal answered, with recommendations.
  Well No. 9, abandon. P 4-780.
    Proposal answered, with recommendations.

Chanslor-Canfield Midway Oil Co.—Continued.

Well No. 9, abandonment. P 4-1310.

Approval of removal of surface equipment given, with the proviso that well be left in such condition that it may be gone into for further work later if necessary.

SECTION 14.

Standard Oil Co.

Well No. 8, redrill. P 4-1054.

Proposal rejected, for not containing provision for protection of oil zone.

Well No. 8, shut off. T 4-1106.

Shut-off rejected.

Well No. 8, supplementary redrill. P 4-1228.

Proposal rejected.

Well No. 8, supplementary redrill. P 4-1261.

Representatives of the companies in this locality were called in conference by the State Oil and Gas Supervisor for consideration of the conditions of this well. It was the opinion of these representatives that the condition of this well might result in no particular damage to the surrounding territory. However this decision was not to establish a precedent of low shut-off in this locality. It was further agreed that it be definitely understood that in the future all such proposals were to be presented to this Bureau by the companies through their geological departments.

The above conference led to an agreement by the geologists of the companies concerned, that they work up and submit a report on the underground conditions in this locality. This report has not, as yet, been submitted.

In accordance with the above decision, the proposal to drill the well in without changing the shut-off was approved.

Union Oil Co., "Regal."

Well No. 4, shut off. T 4-526.

Shut-off rejected.

Well No. 4, shut off. T 4-527.

Another shut-off recommended.

Well No. 4, shut off. T 4-642.

Shut-off approved.

Well No. 9, drill. P 4-757.

Proposal approved.

Well No. 9, shut off. T 4-1045.

Shut-off approved.

Well No. 9, shut off. T 4-1162.

Test indicated that 10″ shut-off was not leaking. Additional tests to locate source of water recommended.

Well No. 9, shut off. T 4-1192.

Decision deferred, pending production test.

Well No. 9, redrill. P 4-487.

Proposal approved, with recommendations.

SECTION 15.

Spellacy and Thompson Oil Co.

Well No. 1, redrill. P 4-772.

Proposal approved, conditionally.

Well No. 1, redrill. P 4-869.

Proposal approved, with recommendations.

Well No. 1, shut off. T 4-907.

Passed for production test.

Well No. 1, abandon. P 4-1281.

Proposal answered, with specifications.

Well No. 1, special test. T 4-1268.

Placing of cement plug approved.

Spellacy and Thompson Oil Co.—Continued.
Well No. 1, shut off. T 4-1290.
Another test recommended.
Well No. 1, special test. T 4-1332.
Mudding witnessed.
Well No. 1, special test. T 4-1363.
Placing of cement plug approved.
Well No. 1, special test. T 4-1364.
Recommended making further attempts to mud hole.
Well No. 1, special test. T 4-1379.
Report on attempts at mudding under pressure. Recommended no further mudding be attempted.

Montana Wyoming Oil Co.
Well No. 2, redrill. P 4-742.
Proposal approved, conditionally.
Well No. 2, redrill. P 4-819.
Proposal approved.

Empire Gas and Fuel Co.
Well No. 3, abandon. P 4-758.
Proposal answered, with specifications.
Well No. 3, special test. T 4-789.
Shooting approved.
Well No. 3, special test. T 4-792.
Placing of cement plug approved.
Well No. 3, special test. T 4-834.
Placing of cement plug approved.

Chanslor-Canfield Midway Oil Co.
Well No. 2, drill. P 4-1117.
Proposal approved.
Well No. 2, shut off. T 4-1170.
Shut-off approved.
Well No. 2, redrill. P 4-1365.
Proposal approved.

SECTION 16.

North American Oil Consolidated.
Well No. 71, redrill. P 4-518.
Proposal approved, conditionally.
Well No. 71, shut off. T 4-535.
Test showed formations behind water string protected, but those below shoe of water string were open to damage.

Chanslor-Canfield Midway Oil Co.
Well No. 8, redrill. P 4-1276.
Proposal approved.
Well No. 26, drill. P 4-1449.
Proposal approved.
Well No. 27, drill. P 4-1450.
Proposal approved.

SECTION 21.

Chanslor-Canfield Midway Oil Co.
Well No. 13, drill. P 4-866.
Proposal approved.
Well No. 13, shut off. T 4-917.
Shut-off approved.
Well No. 14, drill. P 4-1033.
Proposal approved.
Well No. 14, shut off. T 4-975.
Shut-off approved.

Chanslor-Canfield Midway Oil Co.—Continued.
  Well No. 15, drill. P 4-1179.
    Proposal approved.
  Well No. 15, shut off. T 4-1234.
    Shut-off approved.
  Well No. 16, drill. P 4-1344.
    Proposal approved.

SECTION 22.

General Petroleum Corp.
  Well No. 2, abandon. P 4-984.
    Proposal answered, with specifications.

Fairbanks Oil Co.
  Well No. 12, shut off. T 4-523.
    Shut-off approved.
  Well No. 13, shut off. T 4-662.
    Shut-off approved.

F. B. Chapin.
  Well No. 4, alter casing. P 4-891.
    Decision withheld, pending a bailing test.
  Well No. 4, pumping test. T 4-948.
    This test as recommended in Report No. P 4-891. Test inconclusive; another recommended.

Pan-American Petroleum Co., "West 40."
  Well No. 3, redrill. P 4-625.
    Proposal approved.
  Well No. 3, special test. T 4-696.
    Witnessed hole open.
  Well No. 3, shut off. T 4-703.
    Decision withheld.
  Well No. 3, shut off. T 4-713.
    Passed for production test.
  Well No. 3, production test. T 4-814.
    Test showed old plugging still efficiently holding water out of oil-bearing formations. Further work recommended.

SECTION 23.

Traders Oil Co.
  Well No. 71, redrill. P 4-763.
    Proposal approved.
  Well No. 77, special test. D-911.
    Test to locate fluid leved. Level found at 892′ 6″.
  Well No. 105, special test. D-925.
    Fluid level found at 787′.
  Well No. 106, special test. T 4-629.
    Fluid level located at 960′.

Indian and Colonial Development Co.
  Well No. 11, redrill. P 4-624.
    Proposal approved.
  Well No. 11, fluid level test. T 4-783.
    Fluid level at 868′.
  Well No. 11, shut-off. T 4-852.
    On basis of this test recommendations were given for carrying on work.
  Well No. 11, special test. T 4-855.
    Test to check up formations given on log.
  Well No. 11, special test. T 4-868.
    Mudding approved.
  Well No. 11, special test. T 4-878.
    Placing of cement plug approved.

Indian and Colonial Development Co.—Continued.

Well No. 11, special test. T 4-972.

Mudding approved.

Well No. 11, special test. T 4-973.

Test on final condition of well preparatory to going on with the recommended work.

Well No. 11, special test. T 4-974.

Test to locate shoe of 8¼".

Well No. 11, special test. T 4-1052.

Plugging as recommended witnessed and approved. This department recommended that this well be made a producer instead of being abandoned.

SECTION 24.

Jameson Oil Co.

Well No. 13, shut-off. T 4-929.

Production test to determine the condition of the well.

Well No 14, deepen. P 4-1029.

Decision withheld pending receipt of information.

Well No. 15, shut-off. T 4-828.

Decision withheld.

Well No. 15, supplementary drill. P 4-859.

Approval withheld pending result of investigation in this territory.

Well No. 15, shut-off. T 4-831.

Final decision withheld.

Well No. 15, test for oil. P 4-1022.

Proposal approved conditionally.

Well No. 15, deepen. P 4-1023.

Proposal approved conditionally.

Well No. 15, deepening. P 4-1275.

Recommended that the company submit a supplementary proposal outlining work to correct conditions at this well.

Well No. 15, deepen. P 4-1340.

Proposal approved conditionally.

Well No. 15, supplementary drill. P 4-1418.

Proposal approved conditionally.

Well No. 17, shut-off. T 4-582.

Shut-off approved.

Well No. 17, shut-off. T 4-827.

Shut-off approved.

Well No. 17, supplementary drill. P 4-858.

Proposal approved.

SECTION 25.

Princeton Oil Co.

Well No. 3, redrill. P 4-1187.

Proposal approved with recommendations.

Well No. 3, shut-off. T 4-1147.

Test indeterminate. Recommended the company plug and test for bottom water.

General Petroleum Corp.

Well No. 34, redrill. P 4-1354.

Proposal approved.

Well No. 43, redrill. P 4-1319.

Proposal approved.

Cresceus Oil Co.

Well No. 1, deepen and redrill. P 4-1154.

Proposal answered with specifications.

Well No. 7, redrill. P 4-1030.

Proposal approved.

SECTION 26.

Wilbert Oil Co.
Well No. 9, drill. P 4-570.
Proposal approved conditionally.
Well No. 10, drill. P 4-1495.
Proposal approved conditionally.

Mascot Oil Co.
Well No. 3, redrill. P 4-684.
Proposal approved.
Well No. 6, abandon. P 4-831.
Proposal answered with specifications.
Well No. 6, supplementary redrill. P 4-899.
Proposal approved.
Well No. 6, shut-off. T 4-934.
Shut-off approved.
Well No. 17, special test. T 4-1191.
Plugging witnessed.
Well No. 17, redrill. P 4-1278.
Proposal approved.
Well No. 17, special test. T 4-1285.
Report on shooting and plugging with cement.
Well No. 19, redrill. P 4-616.
Proposal approved.
Well No. 34, redrill. P 4-576.
Proposal to pull line rand put in screen pipe approved.

J. M. S. Oil Lease.
Well No. 5, abandon. P 4-870.
Proposal approved.
Well No. 5, abandon. P 4-1478.
Report on abandonment approved.
Well No. 8, drill. P 4-963.
Proposal approved conditionally.
Well No. 8, shut-off. T 4-1002.
Shut-off rejected.
Well No. 8, supplementary drill. P 4-1108.
Proposal approved conditionally.
Well No. 8, supplementary drill. P 4-1141.
Proposal approved.
Well No. 8, special test. T 4-1035.
Test to determine water head.
Well No. 8, special test. T 4-1036.
Test to determine whether or not certain sands are oil bearing. Not oil bearing.
Well No. 8, shut-off. T 4-1086.
Shut-off approved.

Associated Oil Co.
Well No. 25, redrill. P 4-668.
Proposal approved.
Well No. 42, redrill. P 4-669.
Proposal approved.
Well No. 53, redrill. P 4-670.
Proposal to cut casing approved.
Well No. 58, abandon. P 4-650.
Proposal approved.

SECTION 35.

U. G. Wolfe and Associates.
Well No. 1, drill. P 4-654.
Proposal approved provided no top water is found. This department to be notified if top water is encountered, in which case a shut-off above the productive sands will be recommended.

Associated Oil Co.
Well No. 1, deepen. P 4-709.
Proposal approved.
Well No. 1, shut-off. T 4-738.
No test made.
Well No. 1, shut-off. T 4-804.
Another test recommended.
Well No. 1, shut-off. T 4-811.
Test inconclusive due to plug in casing.
Well No. 1, redrill. P 4-924.
Proposal approved.
Well No. 1, supplementary deepen. P 4-1059.
Decision deferred.
Well No. 1, abandon. P 4-1143.
Proposal answered with specifications.
Well No. 1, shut-off. T 4-1186.
Test indicated cement plug tight.
Well No. 1, special test. T 4-1204.
Test on cement plug in 10″ indicated that water below plug was prevented from entering formations above. Further recommendations given.

T. 32 S., R. 24 E., M.D.B. & M.

SECTION 5.

Midway Gas Co.
Well No. 57, drill. P 4-876.
Proposal approved.
Well No. 57, shut-off. T 4-969.
Shut-off approved.

SECTION 7.

Southern Pacific Company, Fuel Oil Department.
Well No. 32, drill. P 4-516.
Proposal approved.
Well No. 32, shut-off. T 4-694.
Shut-off approved.
Well No. 32, shut-off. T 4-823.
Test indeterminate.
Well No. 32, supplementary drill. P 4-854.
Proposal answered with recommendations.
Well No. 32, supplementary drill. P 4-948.
Proposal approved conditionally.
Well No. 32, shut-off. T 4-887.
Passed for production test.
Well No. 32, production test. T 4-1128.
Shut-off approved.

SECTION 8.

Honolulu Consolidated Oil Co.
Well No. 7, deepen. P 4-1027.
Proposal approved conditionally.

SECTION 9.

Southern Pacific Company, Fuel Oil Department.
Well No. 1, alter casing. P 4-769.
Proposal answered with recommendations.
Well No. 1, supplementary alter casing. P 4-947.
Proposal approved conditionally.
Well No. 18, shut-off. D-927.
Shut-off approved.
Well No. 50, drill. P 4-699.
Proposal approved.

Southern Pacific Co., Fuel Oil Department—Continued.
Well No. 50, shut-off. T 4-788.
Shut-off approved.
Well No. 51, drill. P 4-700.
Proposal approved.
Well No. 51, shut-off. T 4-910.
Another test recommended.
Well No. 51, shut-off. T 4-911.
Shut-off approved.
Well No. 52, drill. P 4-701.
Proposal approved.
Well No. 52, shut-off. T 4-786.
Shut-off approved.
Well No. 53, drill. P 4-702.
Proposal approved.
Well No. 53, shut-off. T 4-880.
Shut-off approved.
Well No. 54, drill. P 4-703.
Proposal approved.
Well No. 54, supplementary drill. P 4-1078.
Proposal approved conditionally.
Well No. 54, shut-off. T 4-1012.

Water probably shut off, but due to fact that the casing was first reported cemented at 2205′, and later reported cemented at 2188′, based on measurements of drill pipe after drilling out the cement, the well was passed for production test.

Well No. 54, production test. T 4-1133.
Shut-off approved.
Well No. 55, drill. P 4-704.
Proposal approved.
Well No. 55, shut-off. T 4-1013.
Passed for production test.
Well No. 55, production. T 4-1132.
Shut-off approved.
Well No. 56, drill. P 4-705.
Proposal approved.
Well No. 56, shut-off. T 4-976.
Passed for production test.

Midway Gas Co.
Well No. 60, shut-off. T 4-545.
Shut-off approved.
Well No. 61, drill. P 4-580.
Proposal approved.
Well No. 61, shut-off. T 4-701.
Shut-off approved.

SECTION 10.

Honolulu Consolidated Oil Co.
Well No. 12, drill. P 4-592.
Proposal approved.
Well No. 12, shut-off. T 4-632.
Passed for production test.
Well No. 12, abandon. P 4-945.
Proposal approved.
Well No. 13, drill. P 4-1000.
Proposal rejected.
Well No. 13, drill. P 4-1053.
Proposal approved.
Well No. 13, shut-off. T 4-1030.
Shut-off approved.

Honoulu Consolidated Oil Co.—Continued.
  Well No. 13, deepen. P 4-1338.
    Proposal answered with recommendations.
  Well No. 14, drill. P 4-1104.
    Proposal approved.
  Well No. 14, shut-off. T 4-1118.
    Shut-off approved.
  Well No. 15, shut-off. T 4-1315.
    Shut-off approved.
  Well No. 15, drill. P 4-1292.
    Proposal approved.
  Well No. 16, drill. P 4-1372.
    Proposal answered with recommendations.

SECTION 15.

Southern Pacific Company, Fuel Oil Department.
  Well No. 5, redrill. P 4-1463.
    Proposal approved.
  Well No. 8, drill. P 4-1240.
    Proposal approved.
  Well No. 8, shut-off. T 4-1317.
    Shut-off approved.
  Well No. 9, drill. P 4-1239.
    Proposal approved.
  Well No. 41, drill. P 4-851.
    Proposal approved.
  Well No. 41, shut-off. T 4-873.
    Shut-off approved.
  Well No. 43, drill. P 4-853.
    Proposal approved.
  Well No. 43, shut-off. T 4-1286.
    Shut-off approved.
  Well No. 43, supplementary drill. P 4-1358.
    Proposal approved.
  Well No. 44, drill. P 4-852.
    Proposal approved.
  Well No. 45, drill. P 4-850.
    Proposal approved.
Midway Gas Co.
  Well No. 69, drill. P 4-1414.
    Proposal approved.

SECTION 16.

Standard Oil Co. "Derby."
  Well No. 11, redrill. P4-644.
    Proposal approved.
  Well No. 11, shut-off. T 4-775.
    Shut-off approved.
  Well No. 14, supplementary redrill. P 4-1323.
    Proposal approved.
  Well No. 17, redrill. P 4-1325.
    Proposal approved conditionally.
  Well No. 18, redrill. P 4-1399.
    Proposal approved.
  Well No. 18, shut-off. T 4-1374.
    Shut-off unsatisfactory.
  Well No. 21, redrill. DD-908.
    Proposal approved.

Standard Oil Co., "Derby"—Continued.
- Well No. 21, shut-off. T-4-731.
  - Decision withheld.
- Well No. 21, shut-off. T 4-1183.
  - Shut-off approved.
- Well No. 24, shut-off. T 4-671.
  - Shut-off approved.
- Well No. 25, shut-off. T 4-515.
  - Shut-off unsatisfactory.
- Well No. 25, shut-off. T 4-619.
  - Passed for pdoduction test.
- Well No. 26, shut-off. 2 4-551.
  - Shut-off approved.
- Well No. 27, drill. P 4-651.
  - Proposal approved.
- Well No. 27, shut-off. T 4-856.
  - Shut-off approved.
- Well No. 28, drill. P 4-730.
  - Proposal approved.
- Well No. 28, shut-off. T 4-872.
  - Passed for production test.
- Well No. 29, drill. P 4-740.
  - Proposal approved in part.
- Well No. 29, shut-off. T 4-897.
  - Shut-off approved.
- Well No. 30, drill. P 4-1476.
  - Proposal approved.
- Well No. 31, drill. P 4-808.
  - Proposal approved conditionally.
- Well No. 31, shut-off. T 4-1018.
  - Shut-off approved.

St. Helens Petroleum Co., Ltd.
- Well No. 17, shut-off. T 4-578.
  - Shut-off approved.
- Well No. 19, shut-off. T 4-528.
  - Passed for production test.
- Well No. 19, production test. T 4-667.
  - Shut-off approved.
- Well No. 21, shut-off. T 4-584.
  - Shut-off approved.
- Well No. 22, drill. P 4-610.
  - Proposal approved.
- Well No. 22, shut-off. T 4-637.
  - Shut-off approved.
- Well No. 23, drill. P 4-736.
  - Proposal approved.
- Well No. 23, shut-off. T 4-779.
  - Shut-off approved.
- Well No. 23, deepen. P4-1101.
  - Consideration withheld pending receipt of log.
- Well No. 23, redrill. P 4-1128.
  - Proposal rejected.
- Well No. 24, drill. P 4-875.
  - Proposal approved.
- Well No. 24, special test. T 4-970.
  - Test inconclusive.
- Well No. 24, special test. T 4-971.
  - Passed for production test.

St. Helens Petroleum Co., Ltd.—Continued.
  Well No. 25, drill. P 4-1096.
    Proposal approved.
  Well No. 25, shut-off. T 4-1130.
    Shut-off approved.

Southern California Gas Co.
  Well No. 1, redrill. P 4-1072.
    Proposal approved.
  Well No. 6, shut-off. T 4-1203.
    Test inconclusive.
  Well No. 6, shut-off. T 4-1274.
    Shut-off approved.
  Well No. 7, drill. P 4-582.
    Proposal approved.
  Well No. 7, shut-off. T 4-680.
    Shut-off approved.

Petroleum Midway Company, Ltd.
  Well No. 4, shut-off. T 4-585.
    Decision withheld.
  Well No. 9*a*, shut-off. T 4-607.
    Shut-off approved.
  Well No. 11, drill. P 4-712.
    Proposal approved.
  Well No. 11, shut-off. T 4-845.
    Test unsatisfactory.
  Well No. 11, shut-off. T 4-857.
    Shut-off not approved, but permission given to complete well conditionally.
  Well No. 12, drill. P 4-1477.
    Proposal answered with recommendations.
  Well No. 14, drill. P 4-1021.
    Proposal approved.
  Well No. 14, shut-off. T 4-1067.
    Test inconclusive.
  Well No. 14, shut-off. T 4-1068.
    Test inconclusive.
  Well No. 14, shut-off. T 4-1080.
    Shut-off approved.
  Well No. 14, redrill. P 4-1247.
    Proposal approved.
  Well No. 15, drill. P 4-1148.
    Proposal approved conditionally.

SECTION 17.

Southern Pacific Company, Fuel Oil Department.
  Well No. 10, shut-off. T 4-612.
    Shut-off approved.
  Well No. 10, deepen. P 4-673.
    Proposal approved.
  Well No. 10, shut-off. T 4-688.
    Shut-off approved conditionally.
  Well No. 25, shut-off. T 4-630.
    Shut-off approved.
  Well No. 25, plug. P 4-871.
    Consideration withheld pending receipt of signed copies of log.
  Well No. 29, shut-off. T 4-620.
    Shut-off approved.
  Well No. 60, drill. P 4-884.
    Proposal approved.

Southern Pacific Co., Fuel Oil Department—Continued.
Well No. 60, shut-off. T 4-977.
Shut-off approved.
Well No. 60, shut-off. T. 4-1023.
Passed for production test.
Well No. 60, redrill. P 4-1421.
Decision withheld pending receipt of records.
Well No. 61, drill. P 4-885.
Proposal approved.
Well No. 61, supplementary drill. P 4-1461.
Proposal approved.
Well No. 63, drill. P 4-886.
Proposal approved.
Well No. 63, shut-off. P 4-952.
Test inconclusive.
Well No. 63, shut-off. T 4-933.
Test inconclusive.
Well No. 63, shut-off. T 4-938.
Passed for production test.
Well No. 63, redrill. P 4-1205.
Consideration withheld pending receipt of log.
Well No. 64, drill. P 4-887.
Proposal approved.
Well No. 64, shut-off. T 4-1217.
Shut-off approved.
Well No. 65, drill. P 4-888.
Proposal approved.
Well No. 65, shut-off. T 4-903.
Shut-off approved.

SECTION 18.

Standard Oil Company.
Well No. 7, redrill. P 4-597.
Proposal approved.
Well No. 10, redrill. P 4-1124.
Proposal to plug approved.
Well No. 13, redrill. P 4-1121.
Proposal approved.
Well No. 14, shut-off. T 4-698.
Decision withheld pending result of pumping test.
Well No. 16, supplementary redrill. P 4-913.
Decision withheld pending receipt of records.
Well No. 16, supplementary redrill. P 4-944.
Proposal approved.
Well No. 16, abandon. P 4-1317.
Proposal approved.
Well No. 17, shut-off. D-930.
Shut-off approved.
Well No. 17, shut-off. T 4-504.
Shut-off approved.
Well No. 19, fluid level test. T 4-595.
Decision withheld pending result of pumping test.
Well No. 20, shut-off. T 4-674.
Passed for pumping test.
Well No. 20, supplementary drill. P 4-781.
Proposal approved conditionally.
Well No. 20, shut-off. T 4-780.
Shut-off approved.
Well No. 20, shut-off. T 4-805.
Shut-off approved.

Standard Oil Co.—Continued.
  Well No. 20, supplementary drill. P 4-903.
    Proposal answered with recommendations.

SECTION 19.

Southern Pacific Company, Fuel Oil Department.
  Well No. 3, drill. P 4-635.
    Proposal approved.
  Well No. 4, drill. P 4-634.
    Proposal approved.
  Well No. 4, supplementary drill. P4-764.
    Proposal approved.
  Well No. 4, shut-off. T 4-812.
    Shut-off rejected.
  Well No. 4, supplementary drill. P 4-881.
    Proposal approved conditionally.
  Well No. 4, abandon. P 4-1202.
    Approval withheld pending receipt of signed copies of log.
  Well No. 5, drill. P 4-633.
    Proposal approved.
  Well No. 6, drill. P 4-632.
    Proposal approved.
  Well No. 6, shut-off. T 4-1159.
    Shut-off approved.
  Well No. 23, drill. P 4-1235.
    Proposal approved.
  Well No. 23, shut-off. T 4-1251.
    Shut-off approved.
  Well No. 23, deepen. P 4-1290.
    Proposal approved.
  Well No. 23, shut-off. T 4-1262.
    Shut-off approved.
  Well No. 33, shut-off. T 4-596.
    Shut-off approved.
  Well No. 37, shut-off. T 4-561.
    Test unsatisfactory.
  Well No. 37, shut-off. T 4-576.
    Shut-off rejected.
  Well No .37, supplementary drill. P 4-626.
    Proposal approved.
  Well No. 37, shut-off. T 4-609.
    Shut-off approved.

SECTION 20.

Standard Oil Co.
  Well No. 1, redrill. P 4-762.
    Proposal answered with recommendations.
  Well No. 1, shut-off. T 4-915.
    Passed for production test.
  Well No. 1, redrill. P 4-1236.
    Proposal approved.
  Well No. 1, shut-off. T 4-1361.
    Test inconclusive.
  Well No. 1, shut-off. T 4-1362.
    Test inconclusive.
  Well No. 1, shut-off. T 4-1373.
    Test inconclusive.
  Well No. 3, redrill. P 4-1371.
    Proposal answered with specifications.

SECTION 21.

Southern Pacific Company, Fuel Oil Department.
  Well No. 33, drill. P 4-1188.
    Proposal approved.
  Well No. 33, supplementary drill. P 4-1397.
    Proposal approved.
  Well No. 34, drill. P 4-1086.
    Proposal approved.
  Well No. 34, shut-off. T 4-1151.
    Test inconclusive.
  Well No. 34, shut-off. T 4-1152.
    Passed for production test.
  Well No. 34, plug. P 4-1360.
    Proposal approved.
  Well No. 36, drill. P 4-1087.
    Proposal approved.
  Well No. 36, shut-off. T 4-1174.
    Shut-off approved.
  Well No. 37, drill. P 4-1190.
    Proposal approved.
  Well No. 37, supplementary drill. P 4-1456.
    Proposal approved.

SECTION 22.

Maricopa Investment Company.
  Well No. 1, abandon. P 4-982.
    Proposal approved conditionally.
  Well No. 1, alter casing. P 4-1150.
    Proposal approved conditionally.

SECTION 28.

Standard Oil Co.
  Well No. 9, shut-off. T 4-669.
    Shut-off approved.
  Well No. 10, drill. P 4-1230.
    Proposal approved.
  Well No. 11, drill. P 4-1480.
    Proposal approved.

SECTION 29.

Southern Pacific Company, Fuel Oil Department.
  Well No. 2, supplementary drill. P 4-1503.
    Proposal approved.

SECTION 30.

Standard Oil Co.
  Well No. 7, redrill. P 4-1305.
    Proposal approved conditionally.
  Well No. 14, redrill. P 4-768.
    Proposal approved conditionally.
  Well No. 14, shut-off. T 4-864.
    Shut-off approved.
  Well No. 29, drill. P 4-571.
    Proposal approved conditionally.
  Well No. 29, shut-off. T 4-709.
    Passed for production test.
  Well No. 29, production test. T 4-1043.
    Shut-off approved.
  Well No. 30, shut-off. T 4-645.
    Shut-off approved.
  Well No. 31, drill. P 4-1331.
    Proposal approved.

Standard Oil Co.—Continued.
Well No. 32, drill. P 4-896.
Proposal rejected.
Well No. 32, shut-off. T 4-935.
Test inconclusive.
Well No. 32, shut-off. T 4-942.
Test unsatisfactory.
Well No. 32, supplementary drill. P 4-1013.
Proposal approved.
Well No. 32, special test. T 4-963.
Test showed proposed method of cementing impracticable.
Well No. 32, supplementary drill. P 4-1037.
Proposal approved.
Well No. 32, shut-off. T 4-1046.
Shut-off approved.
Well No. 33, drill. P 4-1262.
Proposal approved.
Well No. 33, supplementary drill. P 4-1304.
Proposal approved conditionally.
Well No. 33, shut-off. T 4-1288.
Shut-off approved conditionally.
Well No. 34, drill. P 4-637.
Proposal approved conditionally.
Well No. 34, shut-off. T 4-736.
Shut-off approved.
Well No. 35, drill. P 4-1020.
Proposal approved.
Well No. 35, shut-off. P 4-1060.
Passed for production test.
Well No. 36, drill. P 4-1334.
Proposal answered with recommendations.

SECTION 31.

Standard Oil Co.
Well No. 2, drill. P 4-676.
Proposal approved.
Well No. 2, shut-off. T 4-745.
Shut-off rejected.
Well No. 2, shut-off. T 4-835.
Shut-off approved.
Well No. 2, deepen and redrill. P 4-1255.
Proposal approved conditionally.
Well No. 2, shut-off. P 4-1261.
Test inconclusive.
Well No. 3, drill. P 4-1209.
Proposal approved conditionally.
Well No. 3, supplementary drill. P 4-1271.
Proposal approved conditionally.
Well No. 3, shut-off. T 4-1229.
Passed for production test.
Well No. 4, drill. P 4-1289.
Proposal answered with recommendations.

SECTION 32.

Knickerbocker Oil Co.
Well No. 1, abandon. P 4-767.
Proposal answered with recommendations.
Well No. 1, supplementary abandon. P 4-1135.
Proposal approved.

Hurley, Stone & Co.
  Well No. 1, deepen. P 4-1324.
    Proposal approved conditionally.
  Well No. 2, redrill. P 4-1204.
    Decision withheld pending receipt of records.
  Well No. 2, redrill. P 4-1223.
    Proposal answered with recommendations.
  Well No. 2, shut-off. P 4-1156.
    Passed for production test.

General Petroleum Corporations.
  Well No. 14, shut-off. T 4-1212.
    Production test showed shut-off unsatisfactory.
  Well No. 14, redrill. P 4-1362.
    Proposal approved.

American Oilfields Co.
  Well No. 1, redrill. P 4-879.
    Proposal approved conditionally.
  Well No. 4, redrill. P 4-1063.
    Proposal approved with recommendations.
  Well No. 4, special test. T 4-1041.
    Fluid level determined.
  Well No. 4, shut-off. T 4-1094.
    Test unsatisfactory.
  Well No. 4, shut-off. T 4-1149.
    Passed for production test.
  Well No. 4, shut-off. T 4-1150.
    Shut-off rejected.
  Well No. 7, redrill. P 4-1064.
    Proposal approved with recommendations.
  Well No. 8, redrill. P 4-1377.
    Proposal answered with recommendations.
  Well No. 12, shut-off. T 4-616.
    Shut-off approved.
  Well No. 13, redrill. P 4-1221.
    Proposal answered with recommendations.

SECTION 33.

Southern Pacific Company, Fuel Oil Department.
  Well No. 14, drill. P 4-1196.
    Proposal rejected.
  Well No. 14, drill, supplementary. P 4-1232.
    Proposal answered with recommendations.
  Well No. 14, shut-off. T 4-1333.
    Decision withheld.
  Well No. 15, drill. P 4-1197.
    Proposal rejected.
  Well No. 16, shut-off. T 4-591.
    Shut-off approved.
  Well No. 16, supplementary drill. P 4-627.
    Proposal approved.
  Well No. 21, shut-off. T 4-536.
    Shut-off approved.

SECTION 34.

Lakeview No. 2 Oil Co.
  Well No. 1, redrill. P 4-1213.
    Proposal approved conditionally.

Lakeview No. 2 Oil Co.—Continued.
  Well No. 23, shut-off. T 4-729.
    Re-cementing recommended.
  Well No. 23, shut-off. T 4-810.
    Shut-off approved.
  Well No. 23, redrill. P 4-1225.
    Proposal approved conditionally.
  Well No. 23, shut-off. T 4-1111.
    Shut-off approved conditionally.
  Well No. 25, drill. P 4-727.
    Proposal rejected pending result of work on adjoining well No. 1.

SUNSET FIELD.

T. 11 N., R. 23 W., S.B.M. & M.

SECTION 4.

Interstate Oil Co.
  Well No. 8, redrill. P 4-500.
    Proposal approved.
  Well No. 8, shut-off. T 4-569.
    Test inconclusive.
  Well No. 8, redrill. P 4-655.
    Proposal approved.
  Well No. 8, special test. T 4-813.
    Cementing approved.
  Well No. 8, shut-off. T 4-874.
    Shut-off approved.
  Well No. 10, shut-off. D-922.
    Shut-off approved.
  Well No. 10, shut-off. T 4-568.
    Passed for production test.
  Well No. 14, shut-off. T 4-553.
    Shut-off approved.
  Well No. 16, drill. P 4-608.
    Proposal approved conditionally.
  Well No. 16, shut-off. T 4-676.
    Test inconclusive.
  Well No. 16, special test. T 4-752.
    Cementing approved.
  Well No. 16, shut-off. T 4-797.
    Shut-off approved.
  Well No. 18, drill. P 4-677.
    Proposal approved.
  Well No. 18, shut-off. T 4-815.
    Shut-off unsatisfactory.
  Well No. 18, supplementary drill. P 4-863.
    Proposal approved.
  Well No. 18, special test. T 4-842.
    Cementing approved.
  Well No. 18, supplementary drill. P 4-1277.
    Proposal rejected with recommendations.
  Well No. 18, supplementary drill. P 4-1287.
    Proposal rejected.
  Well No. 18, shut-off. T 4-1252.
    Test inconclusive.
  Well No. 20, drill. P 4-672.
    Proposal approved.
  Well No. 20, shut-off. T 4-980.
    Test inconclusive.

Interstate Oil Co.—Continued.

Well No. 20, supplementary drill. P 4-1111.
Proposal approved conditionally.
Well No. 20, shut-off. T 4-1173.
Shut-off rejected.
Well No. 22, drill. P 4-1031.
Proposal approved.
Well No. 22, shut-off. T 4-1055.
Shut-off unsatisfactory.
Well No. 22, supplementary drill. P 4-1234.
Proposal approved.
Well No. 22, shut-off. T 4-1265.
Passed for production test.

Lakeview No. 2 Oil Co.

Well No. 1, special test. T 4-693.
Cementing approved.
Well No. 1, shut-off. T 4-675.
Shut-off approved.
Well No. 1, production test. T 4-699.
Test satisfactory.

This well is the Lakeview No. 2 gusher which came in out of control on May 10, 1914, and flowed continuously for 167 days, producing during that period approximately 3,500,000 barrels of oil.

Following the cessation of the well's flow, the company was occupied for about two years in an attempt to put the well in a producing condition. The violent flow of the well wrecked the rig and blew out a crater over the hole of such extent that 46 days time was spent in putting the surface in the condition necessary for the erection of a new rig.

After this rig was up and the first attempts to work on the well were made, the well again came in, wrecking the rig and generally creating havoc. It flowed wild for nine days.

After rigging up again over the hole, the company was able to complete the repairs on the well only after many months work. A great deal of the success of the work has been attributed to the correct use of mud-laden fluid.

That the redrilling was successful is proven by the above test, for after completion the well flowed practically clean oil.

Well No. 7, deepen. P 4-1207.
Proposal approved.
Well No. 9, special test. T 4-500.
Cementing approved.
Well No. 9, shut-off. T 4-575.
Shut-off approved.
Well No. 11, production test. T 4-516.
Another test recommended.
Well No. 11, shut-off. T 4-552.
Shut-off approved.
Well No. 13, drill. P 4-807.
Proposal approved.
Well No. 13, supplementary drill. P 4-890.
Proposal approved.
Well No. 13, shut-off. T 4-918.
Passed for production test.
Well No. 13, production test. T 4-1321.
Shut-off approved.
Well No. 15, drill. P 4-1094.
Proposal approved.
Well No. 15, shut-off. T 4-1166.
Passed for production test.

Lakeview No. 2 Oil Co.—Continued.
  Well No. 15, redrill. P 4-1352.
    Proposal approved.
  Well No. 17, drill. P 4-1312.
    Proposal approved.
  Well No. 17, shut-off. T 4-1316.
    Shut-off approved.
Union Oil Co., "International."
  Well No. 6, drill. P 4-584.
    Proposal rejected with recommendations.
  Well No. 6, special test. T 4-689.
    Witnessed mudding.
  Well No. 6, special test. T 4-702.
    Mudding approved.
  Well No. 6, special test. T 4-723.
    Mudding of oil sand approved.
  Well No. 6, special test. T 4-766.
    Cementing not approved.
  Well No. 6, shut-off. T 4-802.
    Shut-off approved.
  Well No. 7, drill. P 4-694.
    Proposal answered with specifications.
  Well No. 7, deepen. P 4-987.
    Proposal answered with recommendations.
  Well No. 7, supplementary drill. P 4-1259.

This proposal was received one day before that set for a hearing before the Board of District Oil and Gas Commissioners and the State Oil and Gas Supervisor to finally determine the proper method of procedure in drilling this well. It was refused consideration.

Pat Welch Co.
  Well No. 2, drill. P 4-647.
    Proposal answered with recommendations.
  Well No. 2, special test. T 4-793.
    Cementing approved.
  Well No. 2, shut-off. T 4-825.
    Shut-off unsatisfactory.
  Well No. 2, deepen. P 4-889.
    Proposal approved.
  Well No. 2, shut-off. T 4-851.
    Shut-off approved for prospecting ahead.
  Well No. 2, special test. T 4-962.
    Witnessed well flowing.
  Well No. 2, alter casing. P 4-1286.
    Proposal answered with recommendations.
  Well No. 2, shut-off. T 4-1231.

Recommended that the company submit a proposal outlining method of correcting existing conditions.

  Well No. 3, redrill. P 4-653.
    Proposal answered with recommendations.
  Well No. 3, deepen. P 4-1106.
    Proposal approved conditionally.
  Well No. 4, shut-off. T 4-514.
    Shut-off approved.
  Well No. 4, redrill. P 4-714.
    Proposal approved.
  Well No. 5, drill. P 4-1256.
    Proposal approved.

SECTION 5.

Southern Pacific Company, Fuel Oil Department.
  Well No. 26, drill. P 4-1321.
    Proposal approved.
  Well No. 27, drill. P 4-1151.
    Proposal answered with recommendations.
  Well No. 28, drill. P 4-761.
    Proposal approved conditionally.
  Well No. 28, shut-off. T 4-987.
    Shut-off approved.
  Well No. 29, shut-off. T 4-598.
    Shut-off unsatisfactory.
  Well No. 29, special test. T 4-744.
    Cementing witnessed.
  Well No. 29, shut-off. T 4-787.
    Shut-off approved.
  Well No. 29, special test. T 4-853.
    Cementing approved.
  Well No. 29, supplementary drill. P 4-909.
    Proposal approved conditionally.
  Well No. 29, shut-off. T 4-936.
    Shut-off approved.
  Well No. 30, drill. P 4-523.
    Proposal answered with recommendations as to shut-off.
  Well No. 30, supplementary drill. P 4-1047.
    Proposal approved.
  Well No. 30, supplementary drill. P 4-1077.
    Proposal approved.
  Well No. 30, shut-off. T 4-1033.
    Shut-off approved.
  Well No. 31, special test. T 4-501.
    Cementing approved.
  Well No. 31, shut-off. T 4-538.
    Shut-off approved.
  Well No. 61, drill. P 4-524.
    Proposal answered with recommendations as to shut-off.
  Well No. 62, drill. P 4-525.
    Proposal approved.
  Well No. 62, supplementary drill. P 4-800.
    Proposal approved.
  Well No. 63, drill. P 4-526.
    Proposal answered with recommendations as to shut-off.
  Well No. 63, supplementary drill. P 4-1091.
    Proposal approved.
  Well No. 63, supplementary drill. P 4-1077.
    Proposal approved.
  Well No. 64, drill. P 4-527.
    Proposal answered with recommendations as to shut-off.
  Well No. 64, shut-off. T 4-597.
    Decision withheld pending result of pumping test.
  Well No. 64, production test. T 4-773.
    Shut-off approved.
  Well No. 65, drill. P 4-528.
    Proposal approved.
  Well No. 65, shut-off. T 4-1175.
    Test inconclusive.
  Well No. 65, redrill. P 4-1339.
    Proposal approved.

Southern Pacific Co., Fuel Oil Department—Continued.
  Well No. 65, shut-off. T 4-1300.
    Shut-off unsatisfactory.
  Well No. 65, supplementary drill. P 4-1455.
    Proposal approved conditionally.
  Well No. 138, drill. P 4-529.
    Proposal approved.
  Well No. 138, supplementary drill. P 4-898.
    Proposal approved.
  Well No. 138, special test. T 4-869.
    Cementing approved.
  Well No. 138, shut-off. T 4-891.
    Shut-off approved.
  Well No. 138, supplementary drill. P 4-1230.
    Proposal approved.
  Well No. 138, supplementary drill. P 4-1231.
    Proposal approved with recommendations.
  Well No. 138, shut-off. T 4-1172.
    Another test recommended.
  Well No. 138, shut-off. T 4-1184.
    Shut-off rejected.
  Well No. 138, supplementary drill. P 4-1279.
    Proposal approved recommendations.

SECTION 6.

Bankline Oil Co.
  Well No. 1, abandon. P 4-679.
    Proposal answered with specifications.
  Well No. 1, supplementary abandon. P 4-864.
    Proposal approved.
  Well No. 5, abandon. P 4-606.
    Proposal approved.
General Petroleum Corporation.
  Well No. 6-B, abandon. P 4-618.
    Proposal answered with recommendations.
  Well No. 6-B, abandon. P 4-622.
    Proposal approved.
  Well No. 7-B, abandon. P 4-656.
    Proposal approved.
  Well No. 9-B, plug. P 4-1126.
    Proposal approved.
  Well No. 9-B, redrill. P 4-1220.
    Proposal approved conditionally.
  Well No. 9-B, shut-off. T 4-1193.
    Shut-off rejected.
  Well No. 9-B, supplementary redrill. P 4-1350.
    Proposal approved.
  Well No. 9-B, shut-off. T 4-1359.
    Mudding and cementing witnessed.
  Well No. 9-B, supplementary redrill. P 4-1485.
    Proposal approved.
  Well No. 11-B, abandon. P 4-995.
    Proposal answered with recommendations.
  Well No. 11-B. Abandon. P 4-1263.
    Proposal approved.
  Well No. 12-B, supplementary drill. P 4-1051.
    Proposal approved.
  Well No. 12-B, shut-off. T 4-1081.
    Test to determine what future work is necessary.

H. H. Hart and H. M. Payne.
  Well No. 1, shut-off. T 4-695.
    Shut-off approved.
  Well No. 1, redrill. P 4-753.
    Proposal approved.
  Well No. 1, shut-off. T 4-1071.
    Shut-off rejected.

Maricopa National Petroleum Co.
  Well No. 5, redrill. P 4-520.
    Proposal approved with recommendations.
  Well No. 7, redrill. P 4-519.
    Proposal approved.
  Well No. 7, abandon. P 4-1024.
    Proposal approved with recommendations.
  Well No. 7, special test. T 4-1074.
    Mudding approved.
  Well No. 7, special test. T 4-1075.
    Placing of cement plug approved.
  Well No. 7, shut-off. T 4-1076.
    Shut-off rejected.
  Well No. 7, shut-off. T 4-1182.
    Test satisfactory.

SECTION 7.

Standard Oil Co., "Monarch."
  Well No. 1, redrill. P 4-791.
    Proposal approved.
  Well No. 2, shut-off. T 4-681.
    Passed for production test.
  Well No. 2, production test. T 4-1044.
    Shut-off approved.
  Well No. 4, drill. P 4-760.
    Proposal approved conditionally.
  Well No. 4, supplementary drill. P 4-902.
    Proposal approved.
  Well No. 4, supplementary drill. P 4-908.
    Proposal approved conditionally.
  Well No. 4, shut-off. T 4-875.
    Shut-off approved.
  Well No. 5, drill. P 4-759.
    Proposal approved conditionally.
  Well No. 5, shut-off. T 4-858.
    Shut-off unsatisfactory.
  Well No. 5, supplementary drill. P 4-972.
    Proposal approved conditionally.
  Well No. 5, shut-off. T 4-931.
    Shut-off approved.
  Well No. 6, drill. P 4-940.
    Proposal approved conditionally.
  Well No. 6, shut-off. T 4-909.
    Passed for production test.
  Well No. 6, production test. T 4-1208.
    Decision deferred.
  Well No. 7, drill. P 4-1327.
    Proposal approved.
  Well No. 7, shut-off. T 4-1351.
    Shut-off approved.
  Well No. 8, drill. P 4-1328.
    Proposal answered with recommendations as to shut-off.

Standard Oil Co., "Monarch"—Continued.
  Well No. 9, drill. P 4-1329.
    Proposal approved conditionally.

Yellowstone Oil Co.
  Well No. 1, abandon. P 4-648.
    Proposal answered with specifications.
  Well No. 1, supplementary abandon. P 4-832.
    Proposal answered with further specifications.
  Well No. 1, supplementary abandon. P 4-848.
    Proposal answered with modifications of Report No. P 4-832.
  Well No. 1, supplementary abandon. P 4-978.
    Proposal answered with further modifications of the original recommendations.

T. 11 N., R. 24 W., S.B.B. & M.

SECTION 1.

Lowell Oil Co.
  Well No. 10, redrill. P 4-1315.
    Proposal approved.

Standard Oil Co., "Maricopa."
  Well No. 11, redrill. P 4-1125.
    Proposal approved conditionally.
  Well No. 23, redrill. P 4-603.
    Proposal answered with recommendations.
  Well No. 23, redrill. P 4-825.
    Proposal approved conditionally.
  Well No. 23, shut-off. T 4-807.
    Another test recommended.
  Well No. 23, shut-off. T 4-818.
    Passed for production test.
  Well No. 23, production test. T 4-1209.
    Shut-off rejected.
  Well No. 26, redrill. P 4-535.
    Proposal approved conditionally.
  Well No. 26, shut-off. T 4-565.
    Passed for production test.
  Well No. 26, production test. T 4-1039.
    Test showed well making small amount of water.

SECTION 2.

Anchor Oil Co.
  Well No. 1, redrill. P 4-857.
    Proposal answered with recommendations.
  Well No. 1, shut-off. T 4-1107.
    Shut-off approved.
  Well No. 1, redrill. P 4-1348.
    Proposal approved.
  Well No. 2, deepen. P 4-734.
    Proposal approved.
  Well No. 12, redrill. P 4-683.
    Proposal approved conditionally.

Ida May Oil Co.
  Well No. 5 (new), shut-off. T 4-573.
    Shut-off approved.

Maricopa National Petroleum Co.
  Well No. 1, redrill. P 4-640.
    Proposal approved.
  Well No. 2, redrill. P 4-862.
    Proposal answered with recommendations.

Maricopa National Petroleum Co.—Continued.
Well No. 2, shut-off. T 4-966.
Shut-off approved.

McCutchen Bros.
Well No. 3, redrill. P 4-1081.
Proposal answered with recommendations.

Standard Oil Co., "Monarch."
Well No. 3, redrill. P 4-932.
Proposal satisfactory.
Well No. 3, shut-off. T 4-905.
Shut-off approved.
Well No. 28, redrill. DD-910.
Proposal approved.
Well No. 33, redrill. P 4-1110.
Decision withheld pending the receipt of log.
Well No. 33, redrill. P 4-1162.
Proposal approved.
Well No. 33, shut-off. T 4-1189.
Shut-off approved.
Well No. 37, shut-off. T 4-512.
Shut-off approved.
Well No. 38, shut-off. T 4-541.
Passed for production test.
Well No. 39, drill. P 4-1475.
Proposal approved.
Well No. 40, drill. P 4-931.
Proposal answered with recommendations.
Well No. 40, shut-off. T 4-951.
Shut-off approved.
Well No. 40, redrill. P 4-1294.
Proposal approved.
Well No. 40, shut-off. T 4-1256.
Shut-off approved.
Well No. 40, shut-off. T 4-1282.
Shut-off approved.

United Oil Co.
Well No. 4, redrill. P 4-901.
Proposal answered with recommendations.
Well No. 7, drill. P 4-1341.
Proposal answered with recommendations as to shut-off.
Well No. 7, drill. P 4-1404.
This report to supersede and nullify report No. P 4-1341. Answered with recommendations as to point of shut-off.
Well No. 7, special test. T 4-1347.
Test to locate source of water.

SECTION 3.

Heard & Painter Co., "Geneseo."
Well No. 7, drill. P 4-605.
Proposal approved conditionally.
Well No. 7, shut-off. T 4-581.
Shut-off approved.
Well No. 8, drill. P 4-1425.
Proposal approved.

SECTION 12.

Good Roads Oil Co.
Well No. 7-A, redrill. DD-905.
Proposal approved.

Good Roads Oil Co.—Continued.
  Well No. 7-A, shut-off. T 4-502.
    Shut-off approved.
  Well No. 7-A, shut-off. T 4-663.
    Test indicated that bottom water had broken around plug in bottom of hole.
  Well No. 7-A, shut-off. T 4-756.
    Bottom water shut-off approved.
  Well No. 7-A, abandon. P 4-928.
    Proposal approved.
  Well No. 11, drill. P 4-1266.
    Proposal approved.
  Well No. 11, special test. T 4-1279.
    Recommended the hole be bailed and left standing for 12 hours for the next test.
  Well No. 11, shut-off. T 4-1280.
    Shut-off approved.

Walter Snook Oil Co.
  Well No. 5, drill. P 4-1075.
    Proposal approved conditionally.

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SECTION 30.

Whittaker, Doan and Laymance Oil Co.
  Well No. 1, shut-off. T 4-539.
    Shut-off unsatisfactory.

SECTION 31.

Southern Pacific Company, Fuel Oil Department.
  Well No. 2, deepen. P 4-619.
    Proposal approved.
  Well No. 2, special test. T 4-791.
    Cementing approved.
  Well No. 2, abandon. P 4-1018.
    Proposal approved conditionally.
  Well No. 2 (new), drill. P 4-1050.
    Proposal approved.
  Well No. 2 (new), shut-off. T 4-1078.
    Shut-off approved.
  Well No. 2 (new), plug. P 4-1246.
    Proposal approved.
  Well No. 3, shut-off. T 4-832.
    Shut-off approved.
  Well No. 5, shut-off. T 4-757.
    Test unsatisfactory.
  Well No. 5, shut-off. T 4-765.
    Passed for production test.
  Well No. 5, production test. T 4-939.
    Shut-off approved.
  Well No. 6, shut-off. T 4-697.
    Decision withheld pending receipt of history of well.
  Well No. 6, redrill. P 4-741.
    Proposal approved.
  Well No. 6, shut-off. T 4-742.
    Shut-off approved.
  Well No. 41, drill. P 4-1395.
    Proposal approved.
  Well No. 42, drill. P 4-1394.
    Proposal approved.

Southern Pacific Co., Fuel Oil Department—Continued.

Well No. 43, drill. P 4-1393.
Proposal approved.
Well No. 44, drill. P 4-1392.
Proposal approved.
Well No. 45, drill. P 4-1391.
Proposal approved.
Well No. 46, drill. P 4-1347.
Proposal answered with recommendations as to point of shut-off.
Well No. 46, shut-off. T 4-1349.
Test inconclusive.
Well No. 46, shut-off. T 4-1354.
Test inconclusive.
Well No. 46, shut-off. T 4-1355.
Passed for production test.
Well No. 58, supplementary drill. P 4-949.
Proposal approved.
Well No. 58, shut-off. T 4-884.
Shut-off approved.
Well No. 59, shut-off. T 4-587.
Shut-off approved.
Well No. 60, redrill. P 4-739.
Proposal approved.
Well No. 60, shut-off. T 4-747.
Shut-off approved.
Well No. 60, special test. T 4-854.
Cementing approved.
Well No. 60, shut-off. T 4-860.
Shut-off approved.
Well No. 61, shut-off. T 4-566.
Shut-off approved.
Well No. 61, supplementary drill. P 4-765.
Proposal approved conditionally.
Well No. 61, shut-off. T 4-762.
Approval withheld pending receipt of statement as to cementing.
Well No. 61, shut-off. T 4-767.
Shut-off approved.
Well No. 71, drill. P 4-1390.
Proposal approved.
Well No. 72, drill. P 4-1389.
Proposal approved.
Well No. 73, drill. P 4-1388.
Proposal approved.
Well No. 74, drill. P 4-1387.
Proposal approved.
Well No. 75, drill. P 4-1386.
Proposal approved.
Well No. 76, drill. P 4-1385.
Proposal approved.
Well No. 77, drill. P 4-1384.
Proposal approved.
Well No. 78, drill. P 4-1375.
Proposal answered with recommendations as to point of shut-off.
Well No. 80, drill. P 4-1383.
Proposal approved.
Well No. 81, drill. P 4-1382.
Proposal approved.

Southern Pacific Co., Fuel Oil Department—Continued.
Well No. 82, drill. P 4-1381.
Proposal approved.
Well No. 83, drill. P 4-1379.
Proposal approved.
Well No. 84, drill. P 4-1380.
Proposal approved.

SECTION 32.

General Petroleum Corporation, "Annex."
Well No. 1, redrill. P 4-1356.
Proposal approved with recommendations.
Well No. 2, redrill. P 4-1403.
Proposal answered with recommendations.
Well No. 2, special test. T 4-1324.
Test to determine source of water. Water found to be entering hole from below water string.
Well No. 7-A, drill. P 4-1501.
Proposal approved conditionally.

Maricopa Star Oil Co.
Well No. 5, shut-off. T 4-543.
Another test recommended.
Well No. 5, shut-off. T 4-544.
Shut-off approved.
Well No. 5, supplementary redrill. P 4-861.
Proposal approved.
Well No. 5, shut-off. T 4-937.
Decision withheld pending receipt of data.

Midway Northern Oil Co.
Well No. 5, shut-off. T 4-1129.
Answered with recommendations as to correcting conditions.
Well No. 5, deepen. P 4-1335.
Proposal approved.
Well No. 5, shut-off. T 4-1299.
Passed for production test.

Miocene Oil Co.
Well No. 1, redrill. P 4-1376.
Proposal approved.
Well No. 3, drill. P 4-977.
Proposal approved.
Well No. 3, shut-off. T 4-992.
Passed for production test.
Well No. 3, shut-off. T 4-1140.
Production test; decision withheld pending result of future developments in the neighborhood.

Spreckles Oil Co.
Well No. 5, shut-off. T 4-940.
Approval withheld pending result of final work on the well.

Trojan Oil Co.
Well No. 2, drill. P 4-1001.
Proposal approved conditionally.
Well No. 2, shut-off. T 4-1048.
Test inconclusive.
Well No. 2, shut-off. T 4-1049.
Test inconclusive.
Well No. 2, shut-off. T 4-1050.
Another test recommended.

Trojan Oil Co.—Continued.
Well No. 2, shut-off. T 4-1051.
This test was made preliminary to test of shut-off to determine whether casing leaked. Test of casing satisfactory.
Well No. 2, shut-off. T 4-1059.
Shut-off approved.

El Dora Oil Co.
Well No. 2, shut-off. T 4-914.
Shut-off approved.

SECTION 33.

Southern Pacific Company, Fuel Oil Department.
Well No. 11, drill. P 4-996.
Proposal answered with recommendations as to depth of shut-off.
Well No. 11, shut-off. T 4-1091.
Test inconclusive.
Well No. 11, shut-off. T 4-1102.
Decision deferred pending results of future development.
Well No. 11, redrill. P 4-1337.
Consideration withheld pending receipt of log and history.
Well No. 12, drill. P 4-1109.
Proposal approved.

SECTION 34.

Comstock Crude Oil Co.
Well No. 1, abandon. DD-907.
Proposal rejected with recommendations.

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SECTION 25.

Union Oil Co., "Lakeview."
Well No. 9, redrill. P 4-1166.
Proposal approved.
Well No. 9, supplementary redrill. P 4-1264.
Proposal approved.
Well No. 9, supplementary redrill. P 4-1359.
Proposal approved.
Well No. 14, abandon. P 4-992.
Consideration withheld pending receipt of copies of log and history.
Well No. 14, abandon. P 4-1127.
Proposal answered with recommendations.

Southern Pacific Company, Fuel Oil Department.
Well No. 4, alter casing. P 4-812.
Proposal approved.

SECTION 26.

Standard Oil Co., "Monarch."
Well No. 2, deepen. P 4-636.
Proposal approved.
Well No. 2, supplementary deepen. P 4-662.
Proposal approved.
Well No. 2, shut-off. P 4-712.
Passed for production test.
Well No. 6, redrill. P 4-999.
Proposal answered with recommendations as to depth of shut-off.
Well No. 6, shut-off. T 4-646.
Shut-off approved.
Well No. 6, deepen. P 4-868.
Proposal approved.
Well No. 6, redrill. P 4-976.
Proposal approved.

Standard Oil Co., "Monarch"—Continued.
- Well No. 6, shut-off. T 4-1063.
  - Further tests recommended.
- Well No. 6, shut-off. T 4-1064.
  - Passed for production test.
- Well No. 9, redrill. P 4-538.
  - Proposal answered with recommendations.
- Well No. 9, redrill. P 4-585.
  - Proposal approved.
- Well No. 9, shut-off. T 4-656.
  - Passed for pumping test.
- Well No. 9, supplementary redrill. P 4-867.
  - Proposal approved conditionally.
- Well No. 9, supplementary deepen. P 4-975.
  - Proposal answered with recommendations.
- Well No. 12, redrill. P 4-536.
  - Proposal approved.
- Well No. 12, shut-off. T 4-651.
  - Shut-off approved.
- Well No. 13, drill. P 4-631.
  - Proposal approved.
- Well No. 13, shut-off. T 4-740.
  - Shut-off approved.
- Well No. 13, supplementary drill. P 4-981.
  - Proposal approved.
- Well No. 14, drill. P 4-822.
  - Proposal approved.
- Well No. 14, drill. P 4-833.
  - New location: proposal rejected with recommendations.
- Well No. 14, shut-off. T 4-888.
  - Passed for production test.
- Well No. 14, redrill. P 4-1170.
  - Proposal approved with recommendations.
- Well No. 14, drill. P 4-1208.
  - Proposal approved conditionally.
- Well No. 14, shut-off. T 4-1281.
  - Production test unsatisfactory.
- Well No. 15, drill. P 4-675.
  - Proposal approved.
- Well No. 15, shut-off. T 4-782.
  - Shut-off rejected.
- Well No. 15, shut-off. T 4-953.
  - Decision withheld.

SECTION 32.

Mother Colony Oil Co.
- Well No. 1, abandon. P 4-607.
  - Proposal approved conditionally.

SECTION 33.

Tannehill Oil Co.
- Well No. 3, drill. P 4-1366.
  - Proposal approved conditionally.

SECTION 34.

Hillside Oil Co.
- Well No. 1, drill. P 4-1300.
  - Proposal approved conditionally.
- Well No. 1, abandon. P 4-1490.
  - Proposal answered with specifications.

Hillside Oil Co.—Continued.
Well No. 1, shut-off. T 4-1377.
Test inconclusive.
Well No. 1, shut-off. T 4-1378.
Shut-off satisfactory.

Garner-Madison Oil Co.
Well No. 1, drill. P 4-1168.
Proposal approved.
Well No. 2, drill. P 4-1413.
Proposal approved.
Well No. 2, shut-off. T 4-1376.
Passed for production test.

Tannehill Oil Co.
Well No. 9, shut-off. T 4-683.
Production test showed that the well made no water.
Well No. 13, drill. P 4-708.
Proposal approved.
Well No. 14, drill. P 4-910.
Proposal approved.
Well No. 15, drill. P 4-1076.
Proposal approved.
Well No. 15, redrill. P 4-1268.
Proposal answered with recommendations.

SECTION 35.

Midway Oil Co.
Well No. 4, abandon. P 4-560.
Proposal answered with specifications.
Well No. 4, supplementary abandon. P 4-1092.
Proposal answered with recommendations.
Well No. 4, special test. T 4-1008.
Shooting approved.
Well No. 4, special test. T 4-1009.
Placing of cement plug approved.
Well No. 4, special test. T 4-1010.
Placing of shot approved.
Well No. 4, special test. T 4-1082.
Plugging not approved. Another attempt recommended.
Well No. 4, special test. T 4-1366.
Placing of cement plug approved.
Well No. 5, abandon. P 4-521.
Proposal answered with specifications.
Well No. 5, revised abandon. P 4-773.
Proposal as revised approved.
Well No. 7, abandon. P 4-542.
Proposal answered with specifications.
Well No. 7, supplementary abandon. P 4-770.
Proposal answered with recommended changes.
Well No. 7, special test. T 4-866.
Placing of plug approved.
Well No. 7, special test. T 4-885.
This report to correct reported depth as shown in report No. T 4-866. Placing of plug approved.
Well No. 7, special test. T 4-893.
Placing of cement plug approved.
Well No. 7, special test. T 4-894.
Shooting approved.

Midway Oil Co.—Continued.

Well No. 7, special test. T 4-923.

Placing of cement plug approved.

Well No. 7, special test. T 4-959.

Shooting approved.

Well No. 7, special test. T 4-960.

Placing of cement plug approved.

Well No. 7, special test. T 4-961.

Placing of shot approved.

Well No. 7, special test. T 4-981.

Placing of cement plug approved.

Well No. 7, special test. T 4-982.

Shot approved.

Well No. 7, special test. T 4-983.

Placing of cement plug approved.

Well No. 7, special test. T 4-993.

Placing of plug approved.

Well No. 7, special test. T 4-998.

This report to supersede and nullify report No. T 4-993. Placing of plug approved.

Well No. 7, special test. T 4-1026.

Placing of plug approved.

Well No. 7, special test. T 4-1027.

Placing of shot approved.

Well No. 7, special test. T 4-1028.

Placing of cement plug approved.

Well No. 7, special test. T 4-1047.

Placing of cement plug approved.

Well No. 8, abandon. P 4-543.

Proposal answered with specifications for abandonment.

Well No. 8, supplementary abandon. P 4-720.

Proposal answered with recommendations.

Well No. 8, special test. T 4-716.

Witnessed hole open to required depth for cementing.

Well No. 8, special test. T 4-730.

Top of cement plug determined.

Well No. 8, shut-off. T 4-739.

Location of top of cement plug determined.

Well No. 8, supplementary abandon. P 4-766.

Proposal answered with recommendations.

Well No. 8, special test. T 4-739.

Test to determine condition of well.

Well No. 8, special test. T 4-751.

Shooting approved.

Well No. 8, special test. T 4-769.

Company reported location of cement plug.

Well No. 8, special test. T 4-781.

Plugging approved.

Well No. 9, special test. T 4-589.

Mudding approved.

Well No. 9, special test. T 4-613.

Cementing approved.

Well No. 9, shut-off. T 4-628.

Shut-off approved.

Well No. 9, special test. T 4-640.

Cementing approved.

Well No. 9, special test. T 4-648.

Cementing approved.

Midway Oil Co.—Continued.

Well No. 9, abandon. P 4-678.
Proposal approved.
Well No. 9, special test. T 4-659.
Plugging approved.
Well No. 10, abandon. P 4-544.
Proposal answered with recommendations.
Well No. 10, special test. T 4-641.
Depth of hole determined.
Well No. 10, supplementary abandon. P 4-686.
Proposal approved.
Well No. 10, abandon. P 4-687.
Supplementary proposal answered with recommendations.
Well No. 11, shut-off. D-918.
Plugging rejected.
Well No. 11, abandon. P 4-860.
Proposal answered with recommendations.
Well No. 12, abandon. P 4-545.
Proposal answered with recommendations.
Well No. 12, supplementary abandon. P 4-782.
Proposal answered with recommendations.
Well No. 12, special test. T 4-1155.
Depth of hole determined.
Well No. 12, special test. T 4-1167.
Cementing approved.
Well No. 12, special test. T 4-1188.
Plugging approved.
Well No. 12, special test. T 4-1211.
Plugging approved.
Well No. 12, special test. T 4-1127.
Plugging approved.
Well No. 12, shut-off. T 4-1128.
Old shut-off leaking.
Well No. 12, special test. T 4-1240.
Plugging approved.
Well No. 12, special test. T 4-1260.
Cementing approved.
Well No. 12, special test. T 4-1267.
Shooting approved.
Well No. 50, drill. P 4-1370.
Proposal approved.
Well No. 50, shut-off. T 4-1382.
Passed for production test.
Well No. 51, drill. P 4-1369.
Proposal approved.
Well No. 51, shut-off. T 4-1311.
Decision withheld.
Well No. 51, shut-off. T 4-1314.
Shut-off approved.
Well No. 57, drill. P 4-855.
Proposal approved.
Well No. 57, shut-off. T 4-819.
Shut-off approved.
Well No. 58, shut-off. T 4-1245.
Shut-off approved.
Well No. 59, shut-off. T 4-1246.
Shut-off approved, as result of production test.

Midway Oil Co.—Continued.
Well No. 63, drill. P 4-689.
Proposal approved.
Well No. 63, shut-off. T 4-714.
Shut-off approved.
Well No. 64, shut-off. T 4-604.
Shut-off approved.
Well No. 66, drill. P 4-589.
Proposal approved.
Well No. 66, shut-off. T 4-715.
Shut-off approved.
Well No. 67, drill. P 4-923.
Proposal approved.
Well No. 67, shut-off. T 4-881.
Shut-off approved.
Well No. 69, shut-off. T 4-1244.
Passed for production test.

"Webster."
Well No. 14, drill. P-4-1311.
Proposal approved.
Well No. 14, shut-off. T 4-1029.
Passed for production test.
Well No. 15, drill. P 4-1288.
Proposal approved.
Well No. 15, shut-off. T 4-1243.
Shut-off approved.

SECTION 36.

Ethel D. Oil Co.
Well No. 1, supplementary abandon. P 4-1192.
Proposal approved conditionally.
Well No. 20, drill. P 4-882.
Proposal approved.
Well No. 20, shut-off. T 4-898.
Shut-off approved.
Well No. 34, shut-off. T 4-665.
Shut-off approved.
Well No. 35, drill. P 4-612.
Proposal approved.
Well No. 35, shut-off. T 4-574.
Passed for production test.
Well No. 36, drill. P 4-665.
Proposal answered with recommendations as to depth of shut-off.
Well No. 36, shut-off. T 4-728.
Passed for production test.
Well No. 36, redrill. P 4-1032.
Proposal approved.
Well No. 36, shut-off. T 4-989.
Decision withheld.
Well No. 37, drill. P 4-1105.
Proposal answered with recommendations as to depth of shut-off.
Well No. 37, supplementary drill. P 4-1159.
Proposal approved conditionally.
Well No. 37, shut-off. T 4-1083.
Shut-off approved conditionally.
Well No. 38, drill. P 4-1291.
Proposal approved conditionally.
Well No. 38, shut-off. T 4-1319.
Shut-off approved.

Interstate Oil Co.
  Well No. 3, special test. D-932.
    Cementing approved.
  Well No. 4, drill. P 4-1347.
    Proposal approved.
Standard Oil Co., "M. J. M. & M."
  Well No. 17, redrill. P 4-602.
    Proposal approved conditionally.
  Well No. 17, shut-off. T 4-590.
    Shut-off approved.
  Well No. 24, shut-off. T 4-508.
    Additional test recommended.
  Well No. 24, shut-off. T 4-509.
    Passed for production test.
  Well No. 24, production test. T 4-1011.
    Shut-off approved.
  Well No. 28, redrill. P 4-595.
    Proposal approved.
  Well No. 42, drill. P 4-522.
    Proposal answered with recommendations.
  Well No. 42, shut-off. T 4-593.
    Shut-off approved.
  Well No. 43, drill. P 4-530.
    Proposal approved.
  Well No. 43, shut-off. T 4-649.
    Shut-off approved.
  Well No. 44, deepen. P 4-577.
    Proposal approved.
  Well No. 44, shut-off. T 4-655.
    Passed for production test.
  Well No. 44, production test. T 4-985.
    Shut-off approved.
  Well No. 45, drill. P 4-638.
    Proposal approved.
  Well No. 45, shut-off. T 4-682.
    Shut-off approved.
  Well No. 45 ,shut-off. T 4-682.
    Shut-off approved.
  Well No. 47, drill. P 4-722.
    Proposal rejected.
  Well No. 47, shut-off. T 4-924.
    Shut-off rejected.
  Well No. 47, shut-off. T 4-925.
    Passed for production test.
  Well No. 47, supplementary drill. P 4-989.
    Proposal approved.
  Well No. 48, drill. P 4-667.
    Proposal answered with recommendations.
  Well No. 48, shut-off. T 4-790.
    Shut-off approved.
  Well No. 48, special test. T 4-879.
    Cementing approved.
  Well No. 48, shut-off. T 4-912.
    Additional test recommended.
  Well No. 48, shut-off. T 4-913.
    Additional test recommended.
  Well No. 48, shut-off. T 4-926.
    Shut-off rejected.

Standard Oil Co., "M. J. M. & M."—Continued.
- Well No. 48, shut-off. T 4-952.
  - Shut-off approved conditionally.
- Well No. 48, supplementary drill. P 4-1306.
  - Proposal approved.
- Well No. 48, shut-off. T 4-1331.
  - Test inconclusive.
- Well No. 48, shut-off. T 4-1371.
  - Shut-off unsatisfactory.
- Well No. 49, drill. P 4-674.
  - Proposal approved.
- Well No. 49, deepen. P 4-747.
  - Proposal approved.
- Well No. 49, shut-off. T 4-771.
  - Shut-off unsatisfactory.
- Well No. 49, supplementary drill. P 4-964.
  - Proposal approved conditionally.
- Well No. 49, shut-off. T 4-920.
  - Passed for production test.
- Well No. 49, redrill. T 4-1210.
  - Proposal approved.
- Well No. 49, special test. T 4-1121.
  - Cementing approved.
- Well No. 49, shut-off. T 4-1301.
  - Additional test recommended.
- Well No. 49, shut-off. T 4-1302.
  - Test inconclusive.
- Well No. 49, shut-off. T 4-1303.
  - Passed for production test.
- Well No. 50, drill. P4-721.
  - Proposal answered with recommendations as to shut-off.
- Well No. 50, supplementary drill. P 4-967.
  - Proposal approved.
- Well No. 50, supplementary drill. P 4-991.
  - Proposal answered with recommendations.
- Well No. 50, shut-off. T 4-968.
  - Decision withheld pending receipt of records.
- Well No. 50, supplementary drill. P 4-1039.
  - Proposal approved.
- Well No. 50, shut-off. T 4-988.
  - Shut-off approved.
- Well No. 51, drill. P 4-723.
  - Proposal approved with recommendations.
- Well No. 51, shut-off. T 4-821.
  - Shut-off approved.
- Well No. 52, drill. P 4-979.
  - Proposal approved.
- Well No. 52, shut-off. T 4-986.
  - Shut-off rejected.
- Well No. 52, supplementary drill. P 4-1035.
  - Proposal rejected.
- Well No. 52, shut-off. T 4-1037.
  - Shut-off rejected.
- Well No. 52, special test. T 4-1042.
  - Circulation obtained.
- Well No. 52, special test. T 4-1061.
  - Cementing witnessed.

Standard Oil Co., "M. J. M. & M."—Continued.
  Well No. 52, shut-off. T 4-1112.
    Shut-off unsatisfactory.
  Well No. 52, supplementary drill. P 4-1260.
    Proposal approved conditionally.
  Well No. 52, special test. T 4-1168
    Cementing witnessed.
  Well No. 52, shut-off. T 4-1230.
    Shut-off rejected.
  Well No. 52, shut-off. T 4-1308.
    Test inconclusive.
  Well No. 52, shut-off. T 4-1312.
    Test inconclusive.
  Well No. 52, redrill. P 4-1440.
    Proposal approved.

DECISIONS.

KERN RIVER FIELD.

T. 28 S., R. 27 E., M.D.B. & M.

SECTION 25.

Clampitt Oil Co.
  Well No. 1, redrill. P 4-95.
    Proposal answered with recommendations.
  Well No. 2, redrill. P 4-96.
    Proposal approved conditionally.
  Well No. 6, redrill. P 4-97.
    Proposal approved conditionally.
  Well No. 6, shut-off. T 4-103.
    Shut-off approved conditionally.
Fox & Garrett Oil Co.
  Well No. 1, redrill. P 4-88.
    Proposal approved conditionally.
  Well No. 5, redrill. P 4-71.
    Proposal answered with recommendations.
  Well No. 5, shut-off. T 4-67.
    Shut-off approved conditionally.

SECTION 27.

Standard Oil Co.
  Well No. 1, redrill. P 4-54.
    Proposal answered with recommendations.
  Well No. 3, production test. T 4-57.
    Test unsaticfactory; remedial work recommended.
  Well No. 3, plug. P 4-81.
    Proposal approved.
  Well No. 3, redrill. P 4-125.
    Proposal approved.
  Well No. 4, drill. P 4-47.
    Proposal approved with recommendations.
  Well No. 4, shut-off. T 4-77.
    Test inconclusive.
  Well No. 4, shut-off. T 4-90.
    Production test satisfactory.
  Well No. 4, deepen. P 4-121.
    Proposal approved conditionally.
  Well No. 4, shut-off. T 4-95.
    Test unsatisfactory.
  Well No. 4, shut-off. T 4-96.
    Test unsatisfactory.

Standard Oil Co.—Continued.
  Well No. 4, shut-off. T 4-97.
    Shut-off approved.

SECTION 29.

Associated Oil Co., "Brown."
  Well No. 1, shut-off. T 4-13.
    Shut-off rejected.
  Well No. 1, redrill. P 4-25.
    Proposal answered with recommendations.
  Well No. 1, supplementary redrill. P 4-39.
    Proposal approved.
  Well No. 1, redrill. P 4-77.
    Proposal approved.
  Well No. 1, shut-off. T 4-66.
    Test unsatisfactory.
  Well No. 1, supplementary redrill. P 4-89.
    Proposal answered with recommendations.
  Well No. 1, special test. T 4-71.
    Mudding approved.
  Well No. 1, special test. T 4-72.
    Cementing approved.
  Well No. 1, shut-off. T 4-88.
    Shut-off rejected.
  Well No. 1, supplementary drill. P 4-115.
    Proposal approved conditionally.

SECTION 36.

Clampitt Oil Co.
  Well No. 3, shut-off. T 4-8.
    Shut-off approved.
  Well No. 4, drill. P 4-42.
    Proposal rejected.
  Well No. 4, shut-off. T 4-37.
    Shut-off approved with the understanding that another shut-off would be made above oil sands.
  Well No. 4, special test. T 4-44.
    Cementing unsatisfactory.
  Well No. 4, redrill. P 4-87.
    Proposal approved with recommendations.
Tejon Oil Co.
  Well No. 3, redrill. P 4-71.
    Proposal approved as a temporary measure.
  Well No. 6, shut-off. T 4-35.
    Shut-off approved conditionally.
  Well No. 6, production test. T 4-61.
    Decision deferred.
  Well No. 10, redrill. P 4-4.
    Proposal approved.
  Well No. 10, shut-off. T 4-6.
    Passed for production test.
Traffic Oil Co.
  Well No. 8, alter casing. P 4-58.
    Proposal approved.
  Well No. 10, alter casing. P 4-59.
    Proposal answered with recommendations.
  Well No. 11, alter casing. P 4-60.
    Proposal approved.

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SECTION 19.

Traffic Oil Co.
  Well No. 20-A, redrill. P 4-69.
    Work approved as temporary measure.
  Well No. 38, shut-off. T 4-60.
    Production test satisfactory.

SECTION 20.

Boston Petroleum Co.
  Well No. 3-A, redrill. P 4-82.
    Proposal answered with recommendations.
  Well No. 3-A, supplementary redrill. P 4-101.
    Proposal approved conditionally.
  Well No. 3-A, special test. T 4-80.
    Cementing approved.
  Well No. 3-A, shut-off. T 4-86.
    Shut-off approved.
  Well No. 16, shut-off. T 4-2.
    Shut-off approved.
  Well No. 17, shut-off. T 4-9.
    Shut-off approved.
  Well No. 18, drill. P 4-105.
    Proposal approved conditionally.
  Well No. 18, shut-off. T 4-85.
    Shut-off approved.
  Well No. 19, drill. P 4-120.
    Proposal approved conditionally.
  Well No. 19, shut-off. T 4-94.
    Shut-off approved.
  Well No. 20, drill. P 4-126.
    Proposal approved conditionally.

SECTION 28.

Stauffer Oil Co.
  Well No. 9, redrill. P 4-90.
    Proposal approved conditionally.

SECTION 29.

Virginia Oil Co.
  Well No. 17, redrill. P 4-108.
    Proposal answered with recommendations.
  Well No. 17, shut-off. T 4-84.
    Shut-off approved with reservations.
  Well No. 33, drill. P 4-3.
    Proposal answered with recommendations.
  Well No. 33, shut-off. T 4-5.
    Shut-off approved.
  Well No. 34, drill. P 4-37.
    Proposal approved.
  Well No. 34, shut-off. T 4-26.
    Shut-off approved.

SECTION 30.

Associated Oil Co., "Luck."
  Well No. 13, shut-off. T 4-65.
    Production test satisfactory.
  Well No. 17, shut-off. T 4-7.
    Shut-off approved.

McQuigg Bros.
  Well No. 3, abandon. P 4-20.
    Proposal answered with recommendations.

Traffic Oil Co.
  Well No. 1, redrill. P 4-56.
    Proposal approved conditionally.
  Well No. 5, drill. DD-499.
    Proposal approved.
  Well No. 5, shut-off. T 4-4.
    Shut-off satisfactory.

SECTION 31.

Associated Oil Co., "Clarence."
  Well No. 6, redrill. P 4-16.
    Proposal answered with recommendations.
  Well No. 7, redrill. P 4-34.
    Proposal answered with recommendations.

Associated Oil Co., "Sterling."
  Well No. 19, abandon. P 4-117.
    Proposal answered with specifications.
  Well No. 22, abandon. P 4-116.
    Proposal answered with specifications.

Calex Oil Co.
  Well No. 2, redrill. P 4-17.
    Proposal approved.
  Well No. 2, shut-off. T 4-19.
    Shut-off approved conditionally.

Calloma Oil Co.
  Well No. 4, redrill. P 4-24.
    Proposal approved with recommendations.

Peerless Oil Co.
  Well No. 52, alter casing. P 4-45.
    Proposal approved.
  Well No. 57, redrill. P 4-8.
    Proposal approved.
  Well No. 57, production test. T 4-59.
    Decision deferred.
  Well No. 72, shut-off. D-439.
    Shut-off approved.
  Well No. 73, drill. P 4-7.
    Proposal approved.
  Well No. 73, shut-off. T 4-10.

Sovereign Oil Co.
  Well No. 11, shut-off. T 4-1.
    Shut-off approved.

SECTION 32.

Standard Oil Co., "Monte Cristo No. 2."
  Well No. 6, redrill. P 4-14.
    Proposal answered with recommendations.
  Well No. 7, redrill. P 4-70.
    Proposal answered with recommendations.
  Well No. 11, redrill. P 4-35.
    Proposal answered with recommendations.

Associated Oil Co., "Omar."
  Well No. 3, redrill. P 4-85.
    Proposal answered with recommendations.
  Well No. 3, shut-off. T 4-89.
    Shut-off approved.

SECTION 33.

Kern River Oilfields of California, Ltd.
  Well No. 2-A, redrill. P 4-36.
    Proposal approved with recommendations.
  Well No. 2-A, supplementary redrill. P 4-113.
    Proposal approved with recommendations.
  Well No. 2-B, redrill. P 4-128.
    Proposal approved with recommendations.

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SECTION 2.

Petroleum Development Co.
  Well No. 17, drill. P 4-23.
    Proposal approved.
  Well No. 18, drill. P 4-91.
    Proposal approved conditionally.

SECTION 3.

Petroleum Development Co., "Elwood."
  Well No. 21, drill. P 4-78.
    Proposal approved.
  Well No. 21, shut-off. T 4-51.
    Shut-off approved.
  Well No. 22, drill. P 4-110.
    Proposal approved.

Petroleum Development Co., "K. C."
  Well No. 39, drill. P 4-79.
    Proposal approved.
  Well No. 39, shut-off. T 4-75.
    Shut-off approved.
  Well No. 40, drill. P 4-124.
    Proposal approved.
  Well No. 40, shut-off. T 4-92.
    Shut-off approved.
  Well No. 40, shut-off. T 4-93.
    Shut-off approved.
  Well No. 41, drill. P 4-111.
    Proposal approved.

SECTION 4

Alma Oil Co.
  Well No. 2, Jr., special test. T 4-14.
    Fluid level determined.
  Well No. 2, Jr., shut-off. T 4-15.
    Test inconclusive.
  Well No. 2, Jr., shut-off. T 4-16.
    Test inconclusive.
  Well No. 2, Jr., shut-off. T 4-38.
    Test inconclusive.
  Well No. 2, Jr., special test. T 4-50.
    Fluid level determined.
  Well No. 2, Jr., production test. T 4-98.
    Test inconclusive.

Apollo Oil Co.
  Well No. 1, shut-off. T 4-24.
    Shut-off approved.
  Well No. 1, redrill. P 4-63.
    Proposal approved.

Apollo Oil Co.—Continued.
  Well No. 2, redrill. P 4-15.
    Proposal approved.
  Well No. 2, abandon. P 4-21.
    Proposal answered with recommendations.
Associated Oil Co., "Gold Standard."
  Well No. 4, redrill. P 4-86.
    Proposal approved.
East Puente Oil Co.
  Well No. 1, redrill. P 4-13.
    Proposal approved.
Revenue Oil Co.
  Well No. 18, drill. P 4-105.
    Proposal approved.
  Well No. 18, shut-off. T 4-87.
    Shut-off approved.

SECTION 5.

Associated Oil Co., "San Joaquin."
  Well No. 5, abandon. P 4-61.
    Decision withheld pending receipt of records.
  Well No. 5, abandon. P 4-75.
    Proposal answered with recommendations.
Del Rey Oil Co.
  Well No. 5, redrill. P 4-70.
    Proposal answered with recommendations
  Well No. 5, special test. T 4-54.
    Shoe of water string located.
  Well No. 5, special test. T 4-62.
    Cementing not approved.
  Well No. 5, shut-off. T 4-68.
    Decision deferred.
  Well No. 6, redrill. P 4-29.
    Proposal approved.
  Well No. 6, shut-off. P 4-17.
    Shut-off approved.
  Well No. 6, special test. T 4-22.
    Cementing approved.
  Well No. 6, shut-off. T 4-33.
    Shut-off approved.
  Well No. 7, redrill. P 4-55.
    Proposal rejected with recommendations.
  Well No. 7, special test. T 4-47.
    Cementing approved.
  Well No. 7, shut-off. T 4-69.
    Test inconclusive.
  Well No. 9, redrill. P 4-18.
    Proposal approved.
  Well No. 10, redrill. P 4-9.
    Proposal approved.
  Well No. 12, redrill. P 4-50.
    Proposal rejected.
  Well No. 13, drill. P 4-122.
    Proposal approved.
  Well No. 14, drill. P 4-123.
    Proposal approved.
  Well No. 14, shut-off. T 4-102.
    Shut-off approved.

Del Rey Oil Co., "West."
  Well No. 1, redrill. P 4-67.
    Proposal approved conditionally.
  Well No. 1, shut-off. T 4-48.
    Shut-off approved.
  Well No. 3, redrill. P 4-28.
    Proposal approved.
  Well No. 3, supplementary redrill.. P 4-44.
    Proposal approved.
  Well No. 3, special test. T 4-34.
    Cementing approved.
  Well No. 3, shut-off. T 4-64.
    Shut-off rejected.
  Well No. 5, redrill. P 4-2.
    Proposal rejected.

Standard Oil Co., "Monte Cristo No. 1."
  Well No. 7, redrill. P 4-57.
    Proposal answered with recommendations.
  Well No. 7, redrill. P 4-72.
    Proposal answered with recommendations.
  Well No. 7, special test. T 4-40.
    Additional work recommended.
  Well No. 7, special test. T 4-49.
    Cementing unsatisfactory due to insufficient mudding.
  Well No. 7, shut-off. T 4-53.
    Decision withheld.
  Well No. 7, special test. T 4-63.
    Mudding approved.
  Well No. 14, redrill. P 4-33.
    Proposal approved.
  Well No. 23, redrill. P 4-32.
    Proposal approved.
  Well No. 23, supplementary redrill. P 4-48.
    Proposal approved.
  Well No. 23, special test. T 4-30.
    Cementing unsuccessful.
  Well No. 23, special test. T 4-31.
    Cementing approved.
  Well No. 23, shut-off. T 4-41.
    Shut-off approved.
  Well No. 48, redrill. P 4-31.
    Proposal approved with recommendations.
  Well No. 51, abandon. P 4-12.
    Proposal answered with recommendations.
  Well No. 58, redrill. P 4-30.
    Proposal approved with recommendations.
  Well No. 58, shut-off. T 4-21.
    Shut-off approved.
  Well No. 62, redrill. P 4-10.
    Proposal approved.
  Well No. 64, supplementary redrill. P 4-46.
    Proposal approved.
  Well No. 69, drill. P 4-6.
    Proposal approved.
  Well No. 69, shut-off. T 4-11.
    Shut-off approved with reservations.
  Well No. 69, shut-off. T 4-18.
    Shut-off approved.

SECTION 6.

Enos Oil Co.
  Well No. 18, redrill. P 4-107.
    Proposal approved.
  Well No. 22, redrill. P 4-41.
    Proposal answered with recommendations.
  Well No. 22, shut-off. T 4-32.
    Shut-off unsatisfactory.
  Well No. 22, special test. T 4-39.
    Cementing approved conditionally.
  Well No. 22, shut-off. T 4-45.
    Shut-off approved conditionally.
  Well No. 23, drill. P 4-83.
    Proposal approved.
  Well No. 23, supplementary drill. P 4-102.
    Proposal approved conditionally.
  Well No. 23, special test. T 4-79.
    Cementing approved.
  Well No. 23, shut-off. T 4-82.
    Shut-off approved.

SECTION 8.

Frank May, "Golden Rod."
  Well No. 2, redrill. P 4-62.
    Proposal rejected.
  Well No. 2, redrill. P 4-66.
    Proposal approved conditionally.
  Well No. 2, shut-off. T 4-42.
    Test satisfactory.
  Well No. 2, special test. T 4-43.
    Cementing unsatisfactory.
  Well No. 2, shut-off. T 4-52.
    Passed for production test.
  Well No. 2, production test. T 4-101.
    Shut-off approved.

Frank May, "Homer."
  Well No. 4, redrill. P 4-73.
    Proposal approved conditionally.
  Well No. 4, special test. T 4-55.
    Cementing approved.
  Well No. 4, shut-off. T 4-56.
    Decision deferred.
  Well No. 4, production test. T 4-100.
    Shut-off approved.

Prairie Oil Co.
  Well No. 1, abandon. P 4-40.
    Proposal answered with specifications for abandonment.

SECTION 9.

Junction Oil Co.
  Well No. 1, redrill. P 4-87.
    Consideration withheld pending receipt of records.
  Well No. 1, redrill. P 4-92.
    Approval withheld.
  Well No. 3, redrill. P 4-98.
    Proposal answered with recommendations.
  Well No. 3, supplementary redrill. P 4-106.
    Proposal answered with recommendations.

Junction Oil Co.—Continued.
  Well No. 3, shut-off. T 4-81.
    Shut-off approved.
  Well No. 4, redrill. P 4-119.
    Proposal approved.
  Well No. 4, supplementary redrill. P 4-129.
    Proposal approved.
  Well No. 6, redrill. P 4-93.
    Proposal answered with recommendations.
  Well No. 6, special test. T 4-73.
    Shoe of water string located.
  Well No. 6, shut-off. T 4-74.
    Shut-off approved.
  Well No. 8, redrill. P 4-114.
    Proposal approved conditionally.
  Well No. 8, supplementary redrill. P 4-118.
    Proposal approved.
  Well No. 8, shut-off. T 4-91.
    Shut-off rejected.
  Well No. 8, special test. T 4-99.
    Mudding and cementing approved.
  Well No. 10, drill. P 422.
    Proposal approved.
  Well No. 10, shut-off. T 4-23.
    Shut-off rejected.
  Well No. 10, shut-off. T 4-27.
    Shut-off unsatisfactory.
  Well No. 10, supplementary drill. P 4-43.
    Proposal answered with recommendations.
  Well No. 10, alter casing. P 4-53.
    Proposal approved.
  Well No. 10, shut-off. T 4-27.
    Test inconclusive.
  Well No. 11, drill. P 4-38.
    Proposal approved.
  Well No. 11, shut-off. T 4-25.
    Shut-off approved.

Petroleum Development Co.
  Well No. 9, redrill. P 4-5.
    Proposal approved.
  Well No. 9, shut-off. T 4-40.
    Shut-off approved.

Section Five Oil Co.
  Well No. 2, redrill. P 4-80.
    Proposal approved conditionally.
  Well No. 2, shut-off. T 4-76.
    Decision withheld.
  Well No. 2, redrill. P 4-100.
    Proposal approved.
  Well No. 3, redrill. P 4-112.
    Proposal answered with recommendations.
  Well No. 5, redrill. P 4-11.
    Proposal approved.
  Well No. 5, deepen. P 4-19.
    Proposal approved conditionally.

SECTION 10.

Gray Heirs.
  Well No. 30, drill. P 4-49.
    Proposal approved.
  Well No. 30, shut-off. T 4-36.
    Shut-off approved.
  Well No. 30, abandon. P 4-80.
    Proposal approved conditionally.
  Well No. 31, drill. P 4-65.
    Proposal approved.
  Well No. 31, shut-off. T 4-46.
    Shut-off approved.
  Well No. 32, drill. P 4-84.
    Proposal answered with recommendations.
  Well No. 32, shut-off. T 4-70.
    Shut-off approved.
  Well No. 33, drill. P 4-104.
    Proposal approved.
  Well No. 33, shut-off. T 4-83.
    Shut-off approved.
  Well No. 34, drill. P 4-127.
    Proposal approved conditionally.

Petroleum Development Co.
  Well No. 5, redrill. P 4-68.
    Proposal answered with recommendations.
  Well No. 6, drill. P 4-1.
    Proposal approved.
  Well No. 6, shut-off. T 4-3.
    Shut-off approved.
  Well No. 7, drill. P 4-27.
    Proposal approved.
  Well No. 7, shut-off. T 4-20.
    Shut-off approved.
  Well No. 8, drill. P 4-26.
    Proposal approved.
  Well No. 8, shut-off. T 4-29.
    Shut-off approved.

"WILDCAT" WELLS.

T. 26 S., R. 26 E., M.D.B. & M.

SECTION 11.

Hale Syndicate.
  Well No. 1, redrill. P 4-52.
    Proposal approved.
  Well No. 1, shut-off. T 4-41.
    Test unsatisfactory.
  Well No. 1, supplementary redrill. P 4-74.
    Proposal rejected.
  Well No. 1, special test. T 4-58.

Witnessed work indicating that thorough tests recommended by this department, of formations logged as oil-bearing, were not being made.

T. 26 S., R. 27 E., M.D.B. & M.

SECTION 16.

Root, Shoup & Millikin.
Well No. 1, drill. P 4-109.
Proposal approved.

T. 30 S., R. 30 E., M.D.B. & M.

SECTION 7.

Visalia Midway Oil Co., No. 2.
Well No. 1, drill. P 4-64.
Proposal approved.

CHAPTER VI.

FRESNO, KINGS AND OTHER COUNTIES.

By R. D. BUSH, Deputy Supervisor.

The work during the past year for this district has been handled by the deputy, one inspector, and one office assistant. The number of field operations was about the same as for the preceding year, the increase in the drilling of new wells being offset by a decrease in redrilling and deepening. In general there has been no decided change in water conditions in the older parts of the field where those conditions are likely to be most serious. Extensive summaries of production reports for the past two years have been prepared with show for a few companies marked increase in the amount of water produced and for others a corresponding decrease.

No new formal complaints against neighbors' wells have been filed with the bureau and the few informal complaints filed have been amicably settled by calling attention to the unsatisfactory conditions and showing the benefit to be derived by both parties by remedying these conditions. When differences of opinion between operators and this office have arisen regarding the protection of oil sands and drilling methods, they have been agreeably settled by correspondence or discussion which brought out a more complete knowledge of facts regarding underground conditions, and in some cases suggestions for the use of untried methods. Cordial co-operation between the operator and this office has been the rule in carrying on the work of this department.

The following tabulations show the number of wells in this district, the average number producing, their production, logs filed, and details of the notices received and reports made by this office:

	Number
New wells, wells drilled, abandoned wells	1,618
Logs filed	1,415
Graphic logs	920
Producing wells	1,057
Average daily production, barrels oil	45,044
Average daily production, barrels water	10,197
Average daily per well, barrels oil	42.6
Average daily per well, barrels water	9.6
Per cent water	18.4

	Notices	Reports
New wells	123	137
Test water shut-off	180	208
Deepened or redrilled	174	190
Abandonment	36	28

Of the 174 wells in the above tabulation which were deepened or redrilled, 64 were reperforated, redrilled or deepened to increase production, 90 were redrilled or partly plugged to shut off water, and in 20 wells packers were set to shut off water. The column headed "Test Water Shut-Off" includes reports on inspection of plugs in abandonment as well as the ordinary tests for shut off of water which with the addition of the work in the field involved the traveling of over 12,000 auto miles.

The following data, compiled from the production reports covering the past fiscal year, show average production per well and percentages of idle time and productive operation. The minimum number of wells reported producing was 954, and the maximum number 1174, which includes new wells brought in at various times during the year, and which are, of course, reckoned as nonoperative during the period of the year before being put to producing:

Basis 1057.55 well (mean) pumping a total of 349,689 days—	
Number of days productive operation per well for year	330.66
Percentage of time of productive operation	90.6
Percentage of idle time	9.4
Average production per pumping day—bbl. oil	47.01
Average production per pumping day—bbl. water	10.64
Total bbl. fluid	57.65
Basis 1057.55 wells 365 days—bbl. oil	42.58
Bbl. water	9.64
Total bbl. fluid	52.22
Basis 1174 wells—	
Number of days productive operation per well	297.9
Percentage of time of productive operation	81.61
Percentage of idle time	18.39

During the year this office was able to supply information to several operators which was helpful in prevention of damage to oil deposits on their own and neighbors' properties. Some of the instances follow:

The Shell Company drilled a well on Section 29, T. 19 S., R. 15 E., and estimated the depth to the top of oil sand 45′ deeper than the estimate by this office. The casing was cemented according to the company's estimate but the cement job failed. After correspondence and discussion the company agreed to put a plug in the bottom of the casing and perforate at 40′ above the cementing point. This test was made and proved conclusively the presence of an oil sand at or near the point of perforation, giving valuable information for use in future drilling.

A notice was received from the Pantheon Oil Company on Section 32, T. 19 S., R. 15 E., which stated that a well just completed was producing all water and proposing to test the water string for top water. An analysis of the water was also submitted. The company was advised that the analysis showed bottom water and that a lower sand was probably the source. Subsequent work indicated that this was the case.

The Maine State Oil Company proposed to drill a new well on Section 31, T. 19 S., R. 15 E., and cement the water string below some oil sands which are not highly productive but which are open in other wells. After this was called to the company's attention the plan of drilling was changed so that these upper sands were protected from water with mud-fluid.

The Union Oil Company on Section 8, T. 20 S., R. 15 E., proposed to shut off water at an old well by cementing the 6¼″ oil string below a supposed water sand, and to use 4½″ casing for the oil string. This supposed water sand is open in neighboring wells and it was recommended that the water string be tested for a leak. This was done and a hole was found in the 8¼″ casing. Most of the water was shut off by placing a packer on the 6¼″ oil string, thereby saving a string of casing.

DECISIONS.

COALINGA FIELD.

T. 15 S., R. 12 E., M.D.B. & M.

SECTION 21.

Kern-Pucheu Oil Co.

Well No. 1, abandon. P 5-332.

An old well near Mendota. Company's proposal to remove casing was approved, recommending certain shooting and plugging for the protection of the oil sands logged.

T. 19 S., R. 15 E., M.D.B. & M.

SECTION 2.

Imperial Oil Company.

Well No. 6, plug bottom. P 5-56.

Well was drilled ahead to a depth of 2978′ and produced nothing but water. Approved proposal to plug up from the bottom, testing each sand separately for the source of the water.

Well No. 6, cement deeper. P 5-137.

After testing, water was located between 2925′ and 2930′; the proposal to loosen 6¼″ and after mudding carry it down and cement at 2935′ to test out the lower sands was approved.

Well No. 6, recement. P 5-252.

Approved proposal to recement 6¼″ by first pumping mud back of the casing and following it with cement.

Well No. 6, redrill. P 5-314. (By Standard Oil Company.)

Approved proposal to plug bottom of the well and test various sands above the bottom of the 8¼″ and above bottom of the 10″ casing for oil.

Standard Oil Company (formerly General Petroleum Corporation).

Well No. 8, commence drilling. P 5-205.

Recommended cementing 12½″ at about 1835′ instead of 1775′, as proposed.

Well No. 8, supplementary commence drilling. P 5-230.

Approved proposal to use 10″ 40-lb. casing instead of 12½″, as originally proposed, and recommended that the well be completed at about 1860′ instead of 2080′ as proposed.

Standard Oil Co.—Continued.

Well No. 8, shut-off. T 5-155.

On account of 40′ of water which entered the hole in eleven hours, which probably came from the formation below the casing, it was recommended that the well be drilled ahead and further bailing tests made.

Well No. 9, production test. T 5-22.

Test of lead-line sample indicated that all water was shut off.

Well No. 10, commence drilling. P 5-246.

Recommended cementing 10″ casing at 2120′ instead of 1945′ as proposed.

Well No. 10, shut-off. T 5-172.

Test of water shut-off satisfactory.

Well No. 10, commence drilling. P 5-318.

After a criticism by the Standard Oil Company of report recommending cementing below the oil sand which was found at 2090′, it was found that the information given by the company as to the location and elevation of this well was incorrect. The well was surveyed by this department, and from the correct data an estimate was made which agreed within 4′ with the result as found by drilling. This report is made to correct a previous opinion that the oil sand found at 2090′ was one heretofore shut off by surrounding wells.

Well No. 11, commence drilling. P 5-281.

Proposed depth of water shut-off approved.

Well No. 11, shut-off. T 5-200.

Test of water shut-off satisfactory.

Well No. 12, commence drilling. P 5-331.

Recommended cementing 10″ casing at about 1730′ instead of 1710′ as proposed.

Well No. 12, shut-off. T 5-211.

10″ casing was cemented at 1742′. Test of water shut-off satisfactory.

Well No. 13, commence drilling. P 5-340.

Proposed depth of water shut-off approved.

Well No. 15, plug bottom. P 5-23. (By General Petroleum Corporation.)

Approved proposal to plug off bottom water and recommended drilling out cement to at least 2535′. The work of plugging was done prior to filing notice.

Well No. 15, plug bottom. P 5-171. (By S. O. Co.)

Approved proposal to again plug off bottom water.

Well No. 15, test for bottom water. T 5-144.

A bailing test indicated that the supposed bottom water had been exhausted.

Well No. 15, plug bottom. P 5-307. Approved proposal to plug bottom to shut off water which appears to come in pockets.

Well No. 33, cement deeper. P 5-79. (By G. P. Corporation.)

After cementing the 10″ at 2138′ a water sand was encountered at 2140′ Approved proposal to cement the 8¼″ casing below this sand.

Well No. 33, shut-off. T 5-66. (By G. P. Corporation.)

8¼″ casing cemented at 2195′. Test of water shut-off satisfactory.

SECTION 10.

Shell Company of California.

Well No. 2, production test. T 5-39.

A lead-line sample indicated that water is shut off.

Coalinga Midland Oil Company.

Well No. 1, abandon. P 5-2 (by M. C. Kyle).

Approved proposal to abandon, recommending certain depths for plugging. Derrick soon afterward burned down and no work has been done at this well.

SECTION 11.

Southern Pacific Company, Fuel Oil Department.

Well No. 2, redrill. P 5-256.

Recommended plugging bottom instead of redrilling water string as proposed.

Well No. 48, commence drilling. P 5-135.

Proposed depth of water shut-off approved.

Southern Pacific Co., Fuel Oil Department — Continued.

Well No. 48, shut-off. T 5-112.

Test of water shut-off satisfactory.

Well No. 48, cement deeper. P 5-186.

A sand carrying a small amount of water was encountered below the water string. Approved proposal to cement 8¼″ liner below this sand.

Well No. 48, plug bottom. P 5-232.

Approved proposal to plug bottom. Recommended some replugging, which was done prior to filing notice.

Well No. 49, commence drilling. P 5-165.

Recommended cementing not deeper than 1370′ instead of 1390′ as proposed.

Well No. 49, supplementary to commence drilling. P 5-187.

Due to a water sand located in Well No. 48, the proposal to cement at 1403′ instead of 1370′, as previously recommended, was approved.

Well No. 49, shut-off. T 5-127.

Test of water shut-off satisfactory.

Well No. 49, plug bottom. P 5-222.

Approved proposal to plug off bottom water.

Well No. 50, commence drilling. P 5-192.

Depth of water shut-off approved.

Well No. 50, deepen. P 5-223.

After drilling ahead of water string, sand and oil heaved up into casing. Approved proposal to drill ahead and make production test.

Well No. 50, plug bottom. P 5-244.

During drilling each sand was tested separately and water encountered at the bottom. Approved proposal to plug off bottom sand.

Well No. 51, commence drilling. P 5-84.

"Red rock" was reported by the company at 1240′. On this account it was recommended that water be shut off at 1840′ instead of 1879′, as recommended previously.

Well No. 51, cement deeper. P 5-121.

The well was cemented at 1823′, and a water sand encountered below the water string. Approved proposal to cement 8¼″ casing below this sand.

Well No. 51, shut-off. T 5-87.

Test of water shut-off satisfactory.

Well No. 52, shut-off. T 5-88.

Test showed that 75′ of sulphur water entered the hole in seventeen hours. Approved proposal to drill into next sand and bail for test.

Well No. 53, supplementary commence drilling. P 5-48.

Due to an error in the elevation of this well, a revised estimate of the depth of shut-off was made.

Well No. 53, shut-off. T 5-61.

Test of water shut-off satisfactory.

Well No. 53, plug bottom. P 5-168.

Approved proposal to plug off bottom water.

Well No. 79, commence drilling. P 5-214.

Proposed depth of water shut-off approved.

Well No. 79, shut-off. T 5-163.

This test and later ones showed that 90′ of sulphur water entered the hole every twenty-four hours. The proposal to drill into the next sand and test same by bailing was approved.

Well No. 79, cement deeper. P 5-274.

Approved proposal to cement 8¼″ casing below water sand.

Well No. 79, shut-off. T 5-183.

Test of water shut-off satisfactory.

Well No. 86, commence drilling. P 5-242.

Proposed depth of water shut-off approved.

Southern Pacific Co., Fuel Oil Department—Continued.

Well No. 86, shut-off. T 5-193.

Test of water shut-off satisfactory.

Well No. 93, commence drilling. P 5-263.

Proposed depth of water shut-off approved.

Well No. 100, commence drilling. P 5-291.

Proposed depth of water shut-off approved.

Well No. 107, commence drilling. P 5-290.

Proposed depth of water shut-off approved.

SECTION 12.

Associated Oil Company.

Well No. 3, commence drilling. P 5-134.

Recommended cementing at 2990′ instead of 3050′ as proposed. Requested notification of depth of "red rock" for revision of point of water shut-off.

Well No. 3, supplementary commence drilling. P 5-190.

As indicated by the depth of "red rock," it was recommended that water be shut off at 3043′.

Well No. 3, shut-off. T 5-142.

Test showed a level of water in the casing of 318′. It was concluded that the source of the water was the formation below the shoe of the 10″.

Well No. 3, cement deeper. P 5-221.

10″ casing was cemented at 3025′, and it was reported by the company that a water sand was encountered immediately below the shoe of the 10″. Approved proposal to cement 8¼″ casing in the next shale below 3030′

Well No. 3, shut-off. T 5-164.

Test showed that 45′ of water entered the hole in 17 hours, showing that a partial formation shut-off with the 8¼″ had been made. Proposal to drill ahead and test the sands below was approved, with the understanding that a permanent shut-off would be made later should the well show an excessive amount of water.

Well No. 3, recement. P 5-286.

The partial shut-off with 8¼″ was found to be unsatisfactory and the proposal to recement same was approved.

Well No. 3, shut-off. T 5-199.

Test indicated that water present came from formations below 8¼″, and it was concluded that water above the 8¼″ was shut off.

Well No. 3, cement deeper. P 5-334.

Approved proposal to cement 8¼″ not deeper than 3130′.

SECTION 13.

Southern Pacific Company, Fuel Oil Department.

Well No. 3, commence drilling. P 5-95.

Proposed depth of water shut-off approved.

Well No. 3, shut-off. T 5-136.

Test showed that 105′ of water entered the hole in 22½ hours. It was recommended that the well be drilled ahead into first sand and again bailed to determine source of water.

Well No. 3, production test. T 5-156.

A test of lead-line sample showed well making 5 per cent water. Test of water shut-off satisfactory.

SECTION 14.

Shell Company of California.

Well No. 14, reperforate. P 5-86.

Proposal to reperforate oil string approved.

Well No. 14, abandon. P 5-120.

Approved proposal to abandon, recommending that certain casing be left undisturbed.

Shell Co. of California—Continued.

Well No. 16, production test. T 5-35.

Test of a lead-line sample indicated that the work of plugging to exclude bottom water is probably effective.

Well No. 21, shut-off. T 5-31.

Test of water shut-off satisfactory.

Well No. 21, alter casing. P 5-91.

As a result of a fishing job, it was found necessary to drill off the shoe of the water string. It was recommended that the water string be tested after this work.

Well No. 21, shut-off. T 5-63.

Test of water shut-off satisfactory.

Well No. 21, redrill. P 5-145.

Approved proposal to redrill and again test water tsring for source of water.

Well No. 21, abandon. P 5-287.

Approved proposal to abandon and recommended that 10″ be left undisturbed.

Well No. 22, plug bottom. P 5-9.

Approved proposal to plug off bottom water.

Well No. 22, redrill. P 5-71.

Approved proposal to plug well and test 10″ water string and to recement same, if necessary.

Well No. 22, shut-off. T 5-117.

Test of water shut-off satisfactory.

Well No. 28, cement deeper. AA-673.

After drilling ahead of 11″, which was cemented at 2600′, formation and soft cement heaved 700′ up into the casing. Approved proposal to prospect ahead and cement 8¼″ above oil sand.

Well No. 28, shut-off. T 5-43.

Test was not entirely satisfactory, since 1550′ of oil was found in the well. It was recommended that well be completed, after which a production test would be made.

Well No. 29, shut-off. T 5-52.

Test of water shut-off satisfactory.

Well No. 30, commence drilling. P 5-17.

Proposed depth of water shut-off approved.

Well No. 30, shut-off. T 5-62.

Test of water shut-off satisfactory.

Well No. 30, deepen. P 5-213.

Proposal to deepen from 2332′ to 2385′ approved.

Well No. 31, commence drilling. P 5-59.

It was recommended that water be shut off not deeper than 2412′ instead of 2440′ as proposed.

Well No. 31, shut-off. T 5-90.

10″ casing cemented at 2404′. Test of water shut-off satisfactory.

Well No. 31, cement deeper. P 5-146.

A water sand was found below the 10″ casing, and proposal to cement 8¼″ below same was approved.

Well No. 31, shut-off. T 5-108.

Test of water shut-off satisfactory.

Well No. 32, commence drilling. P 5-72.

Proposed depth of water shut-off approved.

Well No. 32, shut-off. T 5-96.

Test of water shut-off satisfactory.

Well No. 33, commence drilling. P 5-81.

Recommended shutting off water at 2370′ instead of 2355′ as proposed.

Well No. 33, shut-off. T 5-98.

10″ cemented at 2376′. Test of water shut-off satisfactory.

Well No. 34, commence drilling. P 5-88.

Proposed depth of water shut-off approved.

Shell Co. of California—Continued.
  Well No. 34, shut-off. T 5-103.
    Test of water shut-off satisfactory.
  Well No. 35, commence drilling. P 5-87.
    Recommended water shut-off at 2120′ instead of 2090′ as proposed.
  Well No. 35, shut-off. T 5-104.
    10″ cemented at 2100′. Test of water shut-off satisfactory.
  Well No. 36, commence drilling. P 5-100.
    Recommended that water be shut off at about 1980′ instead of 1955′ as proposed.
  Well No. 36, shut-off. T 5-109.
    Test of water shut-off satisfactory.
  Well No. 37, commence drilling. P 5-139.
    Proposed depth of water shut-off approved.
  Well No. 37, shut-off. T 5-131.
    Test of water shut-off satisfactory.
  Well No. 38, commence drilling. P 5-293.
    Proposed depth of water shut-off approved.
  Well No. 38, shut-off. P 5-203.
    Test of water shut-off satisfactory.
  Well No. 39, commence drilling. P 5-306.
    Recommended cementing at 2495′ instead of 2515′ as proposed.
  Well No. 44, commence drilling. P 5-227.
    Recommended cementing at 2735′ instead of 2770′ as proposed.
  Well No. 44, shut-off. T 5-186.
    10″ cemented at 2740′. Test of water shut-off satisfactory.

SECTION 20.

Standard Oil Company.
  Well No. 1, abandon. P 5-166.
    Proposal to abandon approved.
  Well No. 2, deepen. P 5-8.
    Proposal to deepen approved.
  Well No. 2, abandon. P 5-175.
    Proposal to abandon approved.
  Well No. 9, abandon. P 5-24.
    Approved proposal to abandon and recommended certain additional plugging.
  Well No. 16, redrill. P 5-97.
    Approved proposal to clean out and set liner and test for production.
  Well No. 16, abandon. P 5-198.
    Proposal to abandon approved.
  Well No. 18, deepen. P 5-122.
    Approved proposal to deepen and test lower formations.
  Well No. 18, abandon. P 5-215.
    Proposal to abandon approved.
  Well No. 22, abandon. P 5-25.
    Approved proposal to abandon. The company's attention was called to the requirement that notice must be given before plugging a well.
  Well No. 24, commence drilling. P 5-337.
    Proposed depth of water shut-off approved.

SECTION 22.

Caribou Oil Mining Company.
  Well No. 26, commence drilling. P 5-270.
    It was recommended that water be shut off at 1090′ instead of 1060′ as proposed.
  Well No. 26, shut-off. T 5-191.
    10″ cemented at 1091′. Test of water shut-off satisfactory.

Standard Oil Company (Peerless).

Well No. 15, redrill and deepen. P 5-78.

Proposal to redrill and deepen was approved and certain additional plugging and testing recommended.

Well No. 15, shut-off. T 5-95.

8¼″ cemented at 1042′ to shut off top water. Test of water shut-off satisfactory.

Well No. 15, plug bottom. P 5-170.

Approved proposal to plug to shut out bottom water. This work was done prior to filing notice and same was called to the attention of the company.

Well No. 15, shut-off. T 5-126.

The test indicated that the bottom plug was effective, and the water present coming from the oil sands.

Well No. 20, redrill. P 5-259.

Approved proposal to recement 10″ casing and if not successful to cement 8¼″ below 10″.

Well No. 20, shut-off. T 5-174.

8¼″ cemented at 1292′. Test of water shut-off satisfactory.

Well No. 23, plug bottom. P 5-26.

Approved proposal to plug off bottom water.

Well No. 24, commence drilling. P 5-15.

Recommended cementing not deeper than 1135′ instead of 1280′ as proposed.

Well No. 24, shut-off. T 5-73.

The 10″ cemented at 1150′ was a failure; 8¼″ casing was cemented at 1170′ and test of same was satisfactory.

Well No. 25, commence drilling. P 5-16.

Recommended cementing not deeper than 1145′ instead of 1270′ as proposed.

Well No. 25, shut-off. T 5-84.

10″ cemented at 1143′. Test of water shut-off satisfactory.

Well No. 26, commence drilling. P 5-112.

Recommended cementing at 1078′ instead of 1030′ as proposed.

Well No. 26, shut-off. T 5-116.

10″ casing cemented at 1014′. Test showed that 110′ of water and 40′ of oil entered the hole. Test of water shut-off not satisfactory, and it was recommended that the 8¼″ be cemented at about 1078′ as previously recommended.

Well No. 26, shut-off. T 5-129.

8¼″ casing cemented at 1058′. Test of water shut-off satisfactory.

Record Oil Co.

Well No. 12, report of work. P 5-58.

Certain work done on this well was not in accordance with recommendations in report AA-491 of February 24, 1917, and an oil sand was left unprotected. This report stated that further recommendations would be made after receipt of notices from the company.

Well No. 12, abandon. P 5-63.

The proposal to abandon was approved and certain shooting and plugging recommended.

Good Luck Oil Co.

Well No. 7, commenced drilling. P 5-105.

Proposed depth of water shut-off approved.

Well No. 7, shut-off. T 5-102.

Test of water shut-off satisfactory.

Well No. 8, commenced drilling. P 5-280.

Recommended that water be shut off at about 1540′ instead of 1530′ as proposed.

Universal Oil Co.

Well No. 2, abandon. P 5-278.

Approved proposal to abandon.

Well No. 2, redrill. P 5-320.

During the work of abandonment, the well showed considerable oil and the proposal to shut off water and produce it was approved.

Universal Oil Co.—Continued.

Well No. 3, redrill. P 5-201.

Proposal to redrill and shut off top water approved.

Well No. 3, plug bottom. P 5-335.

Approved proposal to plug off bottom water.

Well No. 8, abandon. P 5-161.

The proposal to abandon was approved and certain plugging recommended.

Well No. 8, test of plug. T 5-121.

This test was for depth and hardness of cement plug, which were satisfactory. Company's attention was called to the fact that certain requirements in abandonment had not been met, and future development may indicate the necessity of additional work at this well.

Well No. 8, test of plug. T 5-122.

Test of location and hardness of cement plug satisfactory.

Well No. 9, abandon. P 5-41.

After certain plugging and shooting the abandonment was approved.

Well No. 10, commence drilling. P 5-106.

Depth of water shut-off recommended at 1280′ instead of 1230′ as proposed.

Well No. 10, shut-off. T 5-118.

10″ casing cemented at 1295′. Test of water shut-off satisfactory.

Well No. 11, commence drilling. P 5-131.

Proposed depth of water shut-off approved.

Well No. 11, shut-off. T 5-151.

Test of water shut-off satisfactory.

Well No. 12, commence drilling. P5-211.

Recommended depth of water shut-off at about 1345′ instead of 1325′ as proposed.

Well No. 12, shut-off. T 5-178.

8¼″ cemented at 1378′. Test of water shut-off satisfactory.

Well No. 13, commence drilling. P 5-277.

This well was resurveyed by this department and the depth of water shut-off recommended not deeper than 1490′ instead of 1370′ as proposed.

SECTION 26.

Shell Co. of California.

Well No. 2, redrill. AA-672.

The company proposed to redrill and cement the water string below the upper oil sands, 125′ deeper than it was originally cemented, or at 1865′. It was recommended that the 8¼″ be cemented not deeper than 1950′, to be at the same relative depth as neighboring wells.

Well No. 2, supplementary redrill. P 5-109.

After considerable correspondence relative to the above recommendation, the company filed a supplementary proposal to mud up the upper oil sands and cement the 8¼″ at about 1990′. Proposal approved.

Well No. 2, deepen. P 5-163.

Approved proposal to drill 25′ ahead of new water string and make pumping tests of water shut-off.

Well No. 2, shut-off. T 5-114.

It was not possible to make a satisfactory pumping test, and a series of bailing tests reported by the company warranted passing the well for further drilling.

Well No. 25, shut-off. T 5-21.

Test of water shut-off satisfactory.

Well No. 26, shut-off. T 5-26.

Test of water shut-off satisfactory.

Well No. 28, commence drilling. P 5-140.

Proposed depth of water shut-off approved.

Well No. 28, shut-off. T 5-139.

Test of water shut-off satisfactory.

Shell Co. of California—Continued.

Well No. 29, commence drilling. P 5-138.

Approved proposal to shut off water below upper oil sands after thoroughly mudding and cementing.

Well No. 29, recement. P 5-203.

After cementing the 10″ casing, it was found that a joint was split. Approved proposal to perforate the last two joints of 10″ and cement 8¼″ above the first oil sand under pressure.

Well No. 29, deepen. P 5-236.

After drilling ahead of the 8¼″ water string, gas blew all water out of casing. Bailer was run to bottom and came out empty. Approved proposal to complete well and make pumping test.

Well No. 30, commence drilling. P 5-173.

Approved proposal to shut off water below upper oil sands after thoroughly mudding and cementing.

Well No. 30, shut-off. T 5-137.

Test of water shut-off satisfactory.

Well No. 31, commence drilling. P 5-188.

Approved proposal to shut off water below upper oil sands after thoroughly mudding and cementing.

Well No. 30, shut-off. T 5-188.

Test of water shut-off satisfactory.

SECTION 27.

Shell Co. of California.

Well No. 62, abandon. AA-674.

Proposal to abandon approved.

Well No. 79, shut-off. T 5-29.

Test of water shut-off satisfactory.

Well No. 83, redrill. P 5-254.

Approved proposal to redrill and recommended that upper oil sand be thoroughly mudded before cementing below intermediate water.

Well No. 84, shut-off. T 5-18.

Test of water shut-off satisfactory.

Well No. 85, shut-off. T 5-24.

Test of water shut-off satisfactory.

Well No. 85, cement deeper. P 5-21.

Approved proposal to mud upper oil sands and cement below intermediate water.

Well No. 85, shut-off. T 5-48.

Test indicated that water was prevented from entering the oil sands below the water string.

Well No. 86, commence drilling. P 5-4.

Proposed depth of water shut-off approved.

Well No. 86, shut-off. T 5-45.

Test of water shut-off satisfactory.

Well No. 87, commence drilling. P 5-6.

Proposed depth of water shut-off approved.

Well No. 87, shut-off. T 5-44.

Test of water shut-off satisfactory.

Well No. 88, commence drilling. P 5-50.

Proposed depth of water shut-off approved.

Well No. 88, shut-off. T 5-65.

Test of water shut-off satisfactory.

Well No. 89, commence drilling. P 5-51.

Proposed depth of water shut-off approved.

Well No. 89, shut-off. T 5-64.

Test of water shut-off satisfactory. This test reported by the company.

Shell Co. of California—Continued.

Well No. 90, commence drilling. P 5-85.

The Shell Company proposed to drill this well as an experiment and located it 150′ north of No. 78 in order to note the effect on the upper oil sands from which No. 78 is producing. It was proposed to drill the well with rotary tools, to mud up the upper oil sands and intermediate water and cement 10″ casing below the intermediate water with sufficient cement to go above the upper oil sands outside the casing. Proposal approved.

Well No. 90, shut-off. T 5-78.

This test showed that the 10″ was cemented above a water sand and that water above the shoe was shut off.

Well No. 90, cement deeper. P 5-118.

Approved proposal to cement 8¼″ below water sand.

Well No. 90, shut-off. T 5-86.

Test of water shut-off satisfactory.

Well No. 91, commence drilling. P 5-132.

Approved proposal to mud upper oil sands and cement below intermediate water.

Well No. 91, shut-off. T 5-119.

Test of water shut-off satisfactory.

Well No. 92, commence drilling. P 5-172.

Approved proposal to mud upper oil sands and cement below intermediate water.

Well No. 92, shut-off. T 5-143.

Test of water shut-off satisfactory.

Well No. 93, commence drilling. P 5-179.

Approved proposal to mud upper oil sands and cement below intermediate water.

Well No. 93, commence drilling. P 5-196.

Location changed. Approved proposal to mud upper oil sands and cement below intermediate water.

Well No. 93, shut-off. T 5-150.

Test of water shut-off satisfactory.

Well No. 94, commence drilling. P 5-294.

Proposed method of drilling similar to Well No. 90. Notice was received after well was cemented and drilling was started subsequent to letter from State Oil and Gas Supervisor to the company recommending discontinuance of this method pending more definite results of this experiment. Approval withheld until question decided.

Well No. 94, shut-off. T 5-189.

Test of water shut-off satisfactory.

Well No. 95, commence drilling. P 5-206.

Approved proposal to mud upper oil sands and cement below intermediate water.

Well No. 95, shut-off. T 5-158.

Test of water shut-off satisfactory.

Well No. 96, commence drilling. P 5-250.

Approved proposal to mud upper oil sands and cement below intermediate water.

Well No. 96, shut-off. T 5-176.

Test of water shut-off satisfactory.

Well No. 97, commence drilling. P 5-219.

Approved proposal to mud upper oil sands and cement below intermediate water.

Well No. 97, shut-off. T 5-167.

Test of water shut-off satisfactory.

Well No. 98, commence drilling. P 5-295.

Proposal similar to Well No. 90. Approval withheld until question of discontinuance of this method is decided.

Well No. 98, shut-off. T 5-196.

Test of water shut-off satisfactory.

Well No. 99, commence drilling. P 5-312.

Proposal similar to Well No. 90. Approval withheld until question of discontinuance of this method is decided.

Shell Co. of California—Continued.

Well No. 100, commence drilling. P 5-296.

Proposal similar to Well No. 90. Approval withheld until question of discontinuance of this method is decided.

Well No. 100, shut-off. T 5-195.

Test of water shut-off satisfactory.

Well No. 101, commence drilling. P 5-297.

Proposal similar to Well No. 90. Approval withheld until question of discontinuance of this method is decided.

Well No. 102, commence drilling. P 5-298.

Proposal similar to Well No. 90. Approval withheld until question of discontinuance of this method is decided.

Well No. 103, commence drilling. P 5-329.

Proposal similar to Well No. 90. Approval withheld until question of discontinuance of this method is decided.

Well No. 106, commence drilling. P 5-302.

Proposal similar to Well No. 90. Approval withheld until question of discontinuance of this method is decided.

Well No. 107, commence drilling. P 5-311.

Proposal similar to Well No. 90. Approval withheld until question of discontinuance of this method is decided.

SECTION 28.

Standard Oil Company.

Well No. 105, shut-off. T 5-16.

Test of 12½″ casing satisfactory.

Well No. 105, shut-off. T 5-57.

Test of 10″ casing satisfactory.

Well No. 105, shut-off. T 5-101.

Test of 8¼″ casing satisfactory.

Well No. 105, abandon. P 5-227.

Approved proposal to abandon.

Well No. 105, test of plug. T 5-146.

Location of plug and hardness of cement satisfactory.

Well No. 105, test of plug. T 5-149.

Location of plug and hardness of cement satisfactory.

Well No. 106, commence drilling. P 5-328.

Recommended point of water shut-off not deeper than 2890′ instead of 3080′ as proposed.

SECTION 29.

Shell Company of California.

Well No. 6, production test. T 5-8.

A lead-line sample showed considerable water, but a continuation of pumping was recommended.

Well No. 7, commence drilling. P 5-14.

Recommended that 10″ casing be cemented not deeper than 2640′, to be above the top oil sand, which was estimated at 2650′. The company proposed to cement at 2675′ and estimated top of oil sands at 2695′.

Well No. 7, shut-off. T 5-68.

After considerable correspondence and discussion relative to location of top oil sand, the company proceeded to cement the 10″ at 2696′. This test showed that top water was not shut off, and the depth of cementing was disapproved.

Well No. 7, cement deeper. P 5-96.

Proposal to drill ahead and cement 8¼″ above first oil sand encountered disapproved.

Well No. 7, oral proposal to test and recement. P 5-99.

After discussion the company agreed to plug up into 10″ casing and perforate at 2655′ to test for oil and attempt to force cement out through perforations.

Shell Co. of California—Continued.

Well No. 7, test of formation. T 5-80.

The 10″ casing was ripped at 2655′ and considerable oil was shown in the bailing test, proving the existence of an oil sand at or near the point of ripping. It was recommended that the company proceed to recement.

Well No. 7, shut-off. T 5-105.

Test showed that attempt at recementing failed. Recommended shooting and drilling up 10″ and cement 8¼″ above 2650′ to test out oil sand previously shut off.

Well No. 7, cement deeper. P 5-181.

Approved conditionally the proposal to mud up oil sands and cement 8¼″ 78′ below top of first oil sand.

Well No. 7, shut-off. T 5-134.

Test showed that water was shut off from above 2733′.

Section 31.

Commercial Petroleum Company.

Well No. 9, redrill. P 5-101.

Approved proposal to redrill.

Well No. 11, abandon. P 5-276.

Proposal approved, specifying additional shooting and plugging.

Maine State Oil Company.

Well No. 14, commence drilling. P 5-147.

Recommended point of water shut-off not deeper than 1080′ instead of 1300′ as proposed.

Well No. 14, supplementary commence drilling. P 5-150.

Approved proposal to cement 12½″ at 1040′ and 10″ at 1300·. It was later proposed orally to mud upper oil sands and cement 10″ only at 1300′. Proposal approved.

Well No. 14, shut-off. T 5-147.

Test showed top water shut off, but method of drilling was disapproved, since it was believed that not sufficient mudding was done to protect top oil sands. Further protective work at this well is recommended in case damage to sands is shown.

Well No. 14, commence drilling. P 5-304.

Proposal to cement at 1250′ disapproved. Requested further notice stating what protection would be given to oil sands below 1050′.

Well No. 15, supplementary commence drilling. P 5-319.

Approved proposal to mud upper oil sands and cement at 1250′.

W. M. & M. Oil Company.

Well No. 4, abandon. P 5-231.

Proposal approved, specifying additional plugging.

Well No. 4, test of plug. T 5-179.

Test for location and hardness of cement satisfactory.

Well No. 5, abandon. P 5-176.

Proposal approved, specifying depths of shooting and plugging.

Well No. 5, test of plug. T-5-152.

Location and hardness of cement satisfactory.

Section 32.

American Petroleum Company.

Well No. 54, commence drilling. P 5-33.

Recommended depth of water shut-off at 2020′ instead of 2120′ as proposed.

Well No. 54, shut off. T 5-197.

Cemented 10″ at 2014′. Test of water shut-off satisfactory.

Well No. 55, commence drilling. P 5-34.

Recommended depth of water shut-off at 1985′ instead of 2040′ as proposed.

Well No. 55, shut off. T 5-76.

Cemented 10″ at 1985′. Test of water shut-off satisfactory.

American Petroleum Co.—Continued.

Well No. 56, commence drilling. P 5-35.

Recommended depth of water shut-off at 2068′ instead of 2100′ as proposed.

Well No. 56, shut off. T 5-111.

Cemented 10″ at 2067′. Test of water shut-off satisfactory.

Well No. 57, commence drilling. P 5-36.

Recommended depth of water shut-off at 2162′ instead of 2190′ as proposed.

Well No. 57, shut off. T 5-125.

Cemented 10″ at 2161′. Test of water shut-off satisfactory.

Well No. 58, commence drilling. P 5-37.

Proposed depth of water shut-off approved.

Well No. 58, shut off. T 5-148.

Test of water shut-off satisfactory.

Well No. 58, redrill. P 5-267.

Approved proposal to test water string.

Well No. 58, shut off. T 5-219.

Test of 8¼″ was inconclusive. Approved proposal to complete well and make production test.

Well No. 59, commence drilling. P 5-38.

Proposed depth of water shut-off approved.

Well No. 59, shut off. T 5-181.

Test of water shut-off satisfactory.

Well No. 60, commence drilling. P 5-266.

Recommended depth of water shut-off at 2420′ instead of 2460′ as proposed.

Well No. 60, supplementary commence drilling. P 5-330.

According to corrected location, recommended water shut-off at 2448′.

Call Oil Company.

Well No. 3, abandon. P 5-303.

Approved proposal, specifying depths of shooting and plugging.

Well No. 4, commence drilling. P 5-216.

Proposed depth of water shut-off approved.

Well No. 4, shut off. T 5-224.

Well passed for further drilling and production test, on account of inconclusive bailing test.

Well No. 5, commence drilling. P 5-339.

Proposed depth of water shut-off approved.

Pantheon Oil Company (by Associated Oil Company).

Well No. 1, shut off. T 5-46.

Test of water shut-off satisfactory.

Well No. 2. commence drilling. P 5-156.

Proposed depth of water shut-off approved.

Well No. 2, shut off. T 5-133.

Test of water shut-off satisfactory.

Well No. 22, shut off. T 5-82.

Test of water shut-off satisfactory.

Well No. 23, commence drilling. P 5-158.

Proposed depth of water shut-off approved.

Well No. 23, shut off. T 5-212.

Test of water shut-off satisfactory.

Well No. 31, shut off. T 5-106.

Test of water shut-off satisfactory.

Well No. 32, shut off. T 5-67.

Test of water shut-off satisfactory.

Well No. 33, shut off. T 5-27.

Test of water shut-off satisfactory.

Well No. 41, commence drilling. P 5-90.

Recommended depth of water shut-off 2297′ instead of 2220′ as proposed.

Pantheon Oil Co.—Continued.

Well No. 41, supplementary commence drilling. P 5-93.

Location of well corrected. Proposed depth of water shut-off approved.

Well No. 41, supplementary commence drilling. P 5-162.

The 10″ cementing job was unsuccessful. Approved proposal to cement in an 8¼″ liner.

Well No. 41, shut off. T 5-123.

Test of water shut-off satisfactory.

Well No. 41, redrill. T 5-316.

Approved proposal to redrill.

Well No. 42, commence drilling. P 5-157.

Proposed depth of shut-off approved.

Well No. 42, supplementary commence drilling. P 5-226.

Approved proposal to move derrick and start new hole.

Well No. 42, shut off. T 5-198.

Test of water shut-off satisfactory.

Well No. 43, commence drilling. P 5-125.

Proposed depth of water shut-off approved.

Well No. 43, shut off. T 5-185.

Test of water shut-off satisfactory.

Well No. 51, redrill. P 5-94.

Proposal to recement 10″ approved.

Well No. 51, recement. P 5-128.

Approved proposal to cement in 8¼″ liner.

Well No. 51, shut off. T 5-92.

Test of water shut-off satisfactory.

Well No. 51, redrill. P 5-217.

Approved proposal to redrill and test water string to locate source of water.

Well No. 51, alter casing. P 5-224.

Recommended that well be plugged in the bottom, since the water analysis indicated that to be the source of water.

Well No. 51, plug bottom. P 5-315.

Proposed depth of plugging approved, but recommended the use of cement instead of lead wool.

Well No. 52, commence drilling. P 5-194.

Proposed depth of water shut-off approved.

Well No. 52, supplementary commence drilling. P 5-301.

10″ casing froze above bottom. Approved proposal to cement 8¼″ casing.

Well No. 52, shut off. T 5-213.

Test of water shut-off satisfactory.

Well No. 53, commence drilling. P 5-195.

Proposed depth of water shut-off approved.

Well No. 53, shut off. T 5-225.

Test of water shut-off satisfactory.

SECTION 33.

Southern Pacific Company, Fuel Oil Department.

Well No. 38, commence drilling. P 5-245.

Recommended depth of water shut-off 3130′ instead of 3153′ as proposed.

Well No. 239 (new), commence drilling. P 5-361.

The old hole was lost and the derrick moved to a new location. Proposed depth of water shut-off approved.

SECTION 34.

Shell Company of California.

Well No. 30, redrill. P 5-237.

Proposal to redrill approved.

Well No. 35, shut off. T 5-59.

Test of water shut-off satisfactory.

Shell Co. of California—Continued.
Well No. 36, shut off. T 5-54.
Test of water shut-off satisfactory.
Well No. 37, commence drilling. P 5-197.
Proposed depth of water shut-off approved.
Well No. 37, shut off. T 5-153.
Test of water shut-off satisfactory.
Well No. 38, commence drilling. P 5-207.
Proposed depth of water shut-off approved.
Well No. 38, shut off. T 5-166.
Test of water shut-off satisfactory.
Well No. 39, commence drilling. P 5-238.
Proposed depth of water shut-off approved.
Well No. 39, shut off. T 5-187.
Test of water shut-off satisfactory.
Well No. 40, commence drilling. P 5-251.
Proposed depth of water shut-off approved.
Well No. 41, commence drilling. P 5-218.
Proposed depth of water shut-off approved.
Well No. 41, commence drilling. T 5-171.
Test of water shut-off satisfactory.
Well No. 42, commence drilling. P 5-257.
Proposed depth of water shut-off approved.
Well No. 43, commence drilling. P 5-233.
Proposed depth of water shut-off approved.

SECTION 35.

Southern Pacific Company, Fuel Oil Department.
Well No. 12, redrill. P 5-253.
Approved proposal to redrill, recommending plugging side-tracked casing.
Well No. 26, shut off. T 5-7.
Well passed for further drilling and production test.
Well No. 26, production test. T 5-38.
Lead-line sample showed trace of water. Test of water shut-off satisfactory.
Well No. 27, commence drilling. P 5-164.
Proposed depth of water shut-off approved.
Well No. 27, shut off. T 5-160.
Test of water shut-off satisfactory.
Well No. 33, shut off. T 5-107.
On account of large amount of fluid in hole, well was passed for further drilling and production test.
Well No. 33, production test. T 5-157.
Test of lead-line sample showed 4.4% free water and 2.4% emulsion. Test satisfactory.
Well No. 37, shut off. T 5-37.
Test of water shut-off satisfactory.
Well No. 38, shut off. T 5-32.
Test of water shut-off satisfactory.
Well No. 38, redrill. P 5-271.
Approved proposal to cement 8¼″ casing below doubtful sand, which may be the source of water.
Well No. 38, shut off. T 5-188.
Test of water shut-off satisfactory.
Well No. 41, shut off. T 5-74.
Test of water shut-off satisfactory.
Well No. 44, shut off. T 5-49.
Well passed for further drilling.

Southern Pacific Co., Fuel Oil Department—Continued.

Well No. 45, shut off. T 5-53.

Test of water shut-off satisfactory.

Well No. 46, commence drilling. P 5-22.

Proposed depth of water shut-off approved.

Well No. 46, cement deeper. P 5-177.

11″ cementing job failed. Approved proposal to cement in 8¼″ liner.

Well No. 46, recement. P 5-243.

Cementing job failed on 8¼″ liner. Approved proposal to pull 8¼″ liner and cement full string of 8¼″ casing.

Well No. 46, shut off. T 5-161.

Test of water shut-off satisfactory.

Well No. 50, commence drilling. P 5-258.

Proposed depth of water shut-off approved.

Well No. 71, commence drilling. P 5-45.

Proposed depth of water shut-off approved.

Well No. 71, shut off. T 5-70.

Test of water shut-off satisfactory.

Well No. 72, shut off. T 5-71.

Test of water shut-off satisfactory.

Well No. 73, commence drilling. P 5-155.

Recommended water shut-off at 2438′ instead of 2458′ as proposed.

Well No. 73, shut off. T 5-135.

11″ casing cemented at 2448′. Test of water shut-off satisfactory.

Well No. 74, commence drilling. P 5-241.

Proposed depth of water shut-off approved.

Well No. 74, shut off. T 5-190.

On account of large amount of fluid in hole, the bailing test was inconclusive and well was passed for further drilling.

Well No. 76, commence drilling. P 5-191.

Proposed depth of water shut-off approved.

Well No. 76, shut off. T 5-170.

10″ cementing job failed. Approved proposal to cement in 8¼″ liner.

Well No. 76, shut off. T 5-175.

Test of water shut-off satisfactory.

Well No. 77, commence drilling. P 5-240.

Proposed depth of water shut-off approved.

Well No. 77, shut off. T 5-194.

Test showed that 11″ cementing job was a failure. Approved proposal to drill ahead about 20′ and cement 8¼″ casing.

Well No. 77, shut off. T 5-204.

Test of water shut-off satisfactory.

Well No. 78, commence drilling. P 5-204.

Proposed depth of water shut-off approved.

Well No. 78, redrill. P 5-282.

11″ casing cemented at 2619′ failed to shut off water. Approved proposal to shoot 11″ casing, redrill, and cement 8¼″ at about 2599′.

Well No. 78. Shut off. T 5-173.

Test showed that water was not shut off, due to split in shoe joint. It was recommended that the company recement 8¼″ casing at about 2600′.

Well No. 78, shut off. T 5-184.

Test inconclusive on account of bridge 470′ above shoe. Recommended putting in oil string to prevent heaving sand, and retesting.

Well No. 90, commence drilling. P 5-323.

Recommended cementing at 2670′ instead of 2690′, as proposed.

Well No. 92, commence drilling. P 5-324.

Recommended cementing at 2725′ instead of 2745′, as proposed.

Well No. 93, commence drilling. P 5-325.

Recommended cementing at 2770′ instead of 2785′, as proposed.

SECTION 36.

Shell Company of California.
  Well No. 1, alter casing. P 5-12.
    Approved proposal to reperforate oil string.
  Well No. 2, production test. T 5-11.
    Lead-line sample showed 22% water. Recommended that well continue to pump.
  Well No. 2, plug bottom. P 5-89.
    Approved proposal to plug off bottom water.
  Well No. 3, redrill. P 5-70.
    Approved proposal to redrill oil string.
  Well No. 3, shut off. T 5-69.
    During redrilling it was necessary to drill off a portion of the water string. This test indicated that water was still shut off.

Standard Oil Company.
  Well No. 1, plug bottom. P 5-82.
    Approved location of plugs to shut off bottom water.
  Well No. 1, supplementary redrill. P 5-115.
    Approved proposal to redrill and shut off top water.
  Well No. 7, commence drilling. P 5-144.
    Proposed depth of water shut-off approved.

T. 20 S., R. 14 E., M.D.B. & M.

SECTION 1.

Penn Coalinga Petroleum Company.
  Well No. 3, redrill. P 5-1.
    Approved proposal to redrill oil string.
  Well No. 6, redrill. P 5-279.
    Approved proposal to redrill oil string.

Zier Oil Company.
  Well No. 19, commence drilling. P 5-57.
    Recommended water shut-off at 310′ instead of 250′ as proposed.
  Well No. 19, shut off. T 5-56.
    Test of water shut-off satisfactory.
  Well No. 20, commence drilling. P 5-126.
    Proposed depth of water shut-off approved.
  Well No. 20, shut off. T 5-93.
    Test of water shut-off satisfactory.
  Well No. 21, commence drilling. P 5-154.
    Proposed depth of water shut-off approved.

SECTION 12.

Coalinga Star Oil Company.
  Well No. 1, redrill. P 5-212.
    Approved proposal to redrill oil string.
  Well No. 2, redrill. P 5-261.
    Approved proposal to redrill oil string.
  Well No. 9, redrill. P 5-317.
    Approved proposal to redrill oil string.
  Well No. 11, production test. T 5-5.
    Test of lead-line sample showed 1% emulsion. Test of water shut-off satisfactory.
  Well No. 11, redrill. P 5-183.
    Approved proposal to redrill oil string.

Homestead Development Company.
  Well No. B1, redrill. P 5-46.
    Approved proposal to redrill oil string.
  Well No. B8, redrill. P 5-283.
    Approved proposal to mud upper oil sand and cement below same.

Homestead Development Co.—Continued.
Well No. B10, shut off. T 5-42.
Test of water shut-off satisfactory.

Pilot Oil Company.
Well No. 4, redrill. P 5-160.
Approved proposal to redrill oil string.
Well No. 6, redrill. P 5-28.
Approved proposal to redrill and test for source of water.
Well No. 6, alter casing. P 5-68.
Approved proposal to set packer on oil string.

Seneca Oil Company.
Well No. 6, supplementary abandon. P 5-67.
Proposed change in method of abandonment approved.
Well No. 6, test of plug. T 5-58.
Location and hardness of cement plug approved.
Well No. 8, commence drilling. P 5-113.
Recommended cementing not deeper than 467′ instead of 490′ as proposed.
Well No. 8, shut off. T 5-128.
10″ cemented at 451′. Test of water shut-off satisfactory.

Associated Oil Company.
Well No. 5, commence drilling. P 5-239.
Proposed depth of water shut-off approved.
Well No. 5, supplementary commence drilling. P 5-289.
Approved proposal to mud upper tar sands and cement 10″ casing below same.
Well No. 5, shut off. T 5-192.
Test of water shut-off satisfactory.

Spinks Crude Oil Company.
Well No. 2A, redrill. P 5-47.
Approved proposal to redrill oil string.
Well No. 8, shut off. T 5-50.
Test of water shut-off satisfactory.
Well No. 8, redrill. P 5-322.
Approved proposal to redrill oil string.

Ward Oil Company.
Well No. 7, alter casing. P 5-338.
Approved proposal to repair oil string.

SECTION 13.

Southern Pacific Company, Fuel Oil Department.
Well No. 12, alter casing. P 5-74.
Approved proposal to set packer on oil string.
Well No. 18, production test. A-359.
Test of lead-line sample warranted approval of water condition.

Union Oil Company of California.
Well No. 4, alter casing. P 5-248.
Approved proposal to set packer on oil string.
Well No. 9, alter casing. P 5-110.
Approved proposal to reset packer.
Well No. 16, production test. T 5-4.
Test of lead-line sample warranted approval of water condition.
Well No. 17, alter casing. P 5-65.
Approved proposal to set packer on oil string.
Well No. 17, alter casing. P 5-193.
Approved proposal to reset packer.
Well No. 17, alter casing. P 5-210.
Approved proposal to reset packer.

SECTION 14.

Strong Oil Company.

Well No. 2, redrill. P 5-27.

Approved proposal to redrill and locate source of water.

Well No. 2, shut off. T 5-85.

Test of water shut-off satisfactory.

SECTION 23.

St. Paul Consolidated Oil Company.

Well No. 2, test of water shut-off. P 5-5.

Certain work was done without notice or approval of this department. Approved proposal to pull 7⅝" casing and pump well for thirty days for test of water shut-off, as well could not be tested by bailing.

Well No. 7A, redrill. P 5-10.

Approved proposal to redrill and shut off water, and specifying certain depths of plugging.

Well No. 7A, alter casing. P 5-200.

Approved proposal to set packer on oil string.

Well No. 7A, abandon. P 5-220.

Approved proposal to abandon, specifying depths of shooting and plugging.

Well No. 7A, supplementary abandon. P 5-249.

Additional information was submitted which warranted change of previous specifications for abandonment.

Well No. 7A, redrill. P 5-313.

Approved proposal to redrill, shutting off water below top oil sand by using sufficient cement to come up between casings and testing same by perforating.

SECTION 24.

Claremont Oil Company.

Well No. 1, plug casing. P 5-40.

Approved proposal to pull out oil string and plug between water string and top oil sand.

Well No. 2, plug casing. P 5-39.

Approved proposal to pull oil string and plug between top oil sand and shoe of water string.

Well No. 2, redrill. P 5-53.

Approved proposal to shut off top water with 6⅝" casing and redrill.

Well No. 5, redrill. P 5-104.

Approved proposal to redrill oil string and set packer.

Well No. 6, alter casing. P 5-19.

Approved proposal to reset packer.

Well No. 8, redrill. P 5-52.

Approved proposal to again plug off bottom water.

Well No. 8, deepen. P 5-107.

Approved proposal to mud oil sands, cement below bottom water, and prospect for deeper oil sands.

Well No. 8, deepen. P 5-288.

Test of 8¼" casing cemented below water sand was inconclusive. Additional water sands were also encountered. Proposal to prospect ahead and locate oil sand before cementing 6⅝" casing approved.

Well No. 8. P 5-305.

Approved proposal to mud lower sands under pressure and cement 6⅝" casing.

Well No. 9, alter casing. P 5-20.

Approved proposal to reset packer.

Well No. 9, alter casing. P 5-265.

Approved proposal to reset packer.

Well No. 19, alter casing. P 5-268.

Approved proposal to set packer on oil string.

Claremont Oil Co.—Continued.
  Well No. 20, shut off. T 5-60.
    Test of water shut-off satisfactory.

Inca Oil Company.
  Well No. 8, alter casing. P 5-102.
    Approved proposal to set packer on oil string.
  Well No. 33, alter casing. P 5-327.
    Approved proposal to set packer on oil string.

Premier Oil Company.
  Well No. 1, redrill. P 5-29.
    Approved proposal to plug bottom and test for bottom water.
  Well No. 1, redrill. P 5-66.
    Approved proposal to continue plugging and testing.
  Well No. 1, shut off. T 5-91.
    6⅝″ casing cemented to shut off top water. Test of water shut-off satisfactory.
  Well No. 6, redrill. P 5-44.
    Approved proposal to redrill oil string.
  Well No. 18, alter casing. P 5-285.
    Approved proposal to set packer in oil string.

Salvia Oil Company.
  Well No. 14, production test. T 5-51.
    Test of lead-line sample warranted approval of water condition.

Traders Oil Company.
  Well No. 19, redrill. .P 5-178.
    Approved proposal to redrill and test for top water.
  Well No. 19, shut off. T 5-120.
    Test indicated that 10″ water string was tight.
  Well No. 19, supplementary redrill. P 5-199.
    Approved proposal to test oil sands and locate source of water.
  Well No. 19, shut off. T 5-130.
    Test indicated that source of water was probably sand. Logged 749–757′.
  Well No. 20, redrill. P 5-234.
    Approved proposal to redrill and test water string.
  Well No. 20, shut off. T 5-182.
    Test proved water string to be tight. Approved proposal to bridge hole and test oil sands.
  Well No. 25, production test. T 5-34.
    Test of lead-line sample indicated that packer shut off top water.

SECTION 25.

Southern Pacific Company, Fuel Oil Department.
  Well No. 31, redrill. P 5-75.
    Approved proposal to set packer on oil string.
  Well No. 35, abandon. P 5-275.
    Approved proposal to abandon, recommending depths of shooting and plugging.
  Well No. 35, test of plugs. T 5-202.
    Location and hardness of cement satisfactory.
  Well No. 39, alter casing. P 5-92.
    Approved proposal to set packer on oil string.
  Well No. 41, alter casing. P 5-151.
    Approved proposal to set packer on oil string.
  Well No. 45, alter casing. P 5-255.
    Approved proposal to set packer on oil string.

SECTION 26.

Coalinga Homestake Oil Company.
Well No. 1A, redrill. P 5-260.
Approved proposal to put in oil string.
Well No. 2A, redrill. P 5-127.
Approved proposal to plug and test deep sands.
Well No. 2A, redrill. P 5-141.
Approved proposal to plug and perforate oil string for production.
Well No. 2A, test of plug. T 5-94.
Location and hardness of cement satisfactory.
Well No. 2A, shut off. T 5-97.
Test of bottom water shut-off satisfactory.

Augustine and Butz Oil Company.
Well No. 6, shut off. T 5-17.
Test indicated that 8¼" casing shut off top water.

Netherlands Oil Company.
Well No. 3, production test. T 5-6.
Test of lead-line sample warranted the continuation of pumping for further test.

Ozark Oil Company.
Well No. 2, redrill. P 5-153.
Approved proposal to redrill oil string.
Well No. 5, redrill. P 5-7.
Approved proposal to bridge and test water string.
Well No. 5, redrill. P 5-11.
Approved proposal to set packer on oil string.

SECTION 34.

Kyle & Lewis.
Progressive Oil Company Well No. 1, abandon. P 5-333.
Approved proposal to abandon without plugging.

T. 20 S., R. 15 E., M.D.B. & M.

SECTION 1.

Southern Pacific Company, Fuel Oil Department.
Well No. 4, shut off. T 5-40.
Test of water shut-off satisfactory.
Well No. 16, commence drilling. P 5-83.
Proposed depth of water shut-off approved after depth to "red rock" was reported.
Well No. 16, cement deeper. P 5-169.
8¼" casing failed to shut off water. Approved proposal to cement in 6¼" liner.
Well No. 46, production test. T 5-14.
Test of lead-line sample showed trace of water. Test of water shut-off satisfactory.
Well No. 47, shut off. T 5-41.
Test of water shut-off satisfactory.
Well No. 138, shut off. T 5-23.
Test of water shut-off satisfactory.
Well No. 138, redrill. P 5-114.
Approved proposal to redrill and shut off top water.
Well No. 138, shut off. T 5-140.
Test of water shut-off satisfactory.

SECTION 2.

Shell Company of California.
Well No. 20, redrill. P 5-124.
Approved proposal to plug bottom and test for production.

Shell Co. of California—Continued.
  Well No. 20, abandon. P 5-182.
    Approved depth of shooting and plugging.
  Well No. 24, alter casing. P 5-103.
    Approved proposal to put in 4½″ liner.
  Well No. 26, alter casing. P 5-18.
    Approved proposal to reperforate oil string.
  Well No. 27, alter casing. P 5-43.
    Approved proposal to reperforate oil string.
  Well No. 28, alter casing. P 5-49.
    Approved proposal to reperforate oil string.
  Well No. 29, alter casing. P 5-69.
    Approved proposal to do additional perforating.
  Well No. 33, alter casing. P 5-13.
    Approved proposal to reperforate oil string.
  Well No. 37, shut off. T 5-169.
    Test of water shut-off satisfactory.
  Well No. 38, shut off. T 5-20.
    Test of water shut-off satisfactory.
  Well No. 38, alter casing. P 5-119.
    Approved proposal to put in string of 4½″ casing.
  Well No. 39, commence drilling. P 5-152.
    Recommended cementing at 3390′ instead of 3415′ as proposed.
  Well No. 39, shut off. T 5-168.
    8¼″ casing cemented at 3400′. Test of water shut-off satisfactory.
  Well No. 40, commence drilling. P 5-208.
    Recommended cementing at 3390′ instead of 3330′ as proposed.
  Well No. 40, shut off. T 5-201.
    8¼″ casing cemented at 3361′. Test of water shut-off satisfactory.

SECTION 3.

Southern Pacific Company, Fuel Oil Department.
  Well No. 29, production test. T 5-12.
    Test of lead-line sample showed .6% water. Test of water shut-off satisfactory.
  Well No. 32, commence drilling. P 5-326.
    Recommended cementing at 2590′ instead of 2660′ as proposed.

SECTION 6.

American Petroleum Company.
  Well No. 16, redrill. P 5-189.
    Approved proposal to redrill oil string.
  Well No. 37, abandon. P 5-116.
    Proposal approved.
  Well No. 37, test of plug. T 5-100.
    Test for location and hardness of cement satisfactory.
Mercantile Crude Oil Company.
  Well No. 6, commence drilling. P 5-55.
    Proposed depth of water shut-off approved.
  Well No. 6, shut off. T 5-79.
    Test of water shut-off satisfactory.

SECTION 7.

Arica Oil Company (By Associated Oil Company).
  Well No. 34, redrill. P 5-42.
    Approved proposal to bridge and test water string.
  Well No. 43, shut off. T 5-9.
    Test of water shut-off satisfactory.

Coalinga Pacific Oil and Gas Company.
Well No. 1, redrill. P 5-76.
Approved proposal to redrill oil string.

Section Seven Oil Company.
Well No. 3, shut off. T 5-28.
Test of water shut-off satisfactory.

SECTION 8.

Union Oil Company of California.
California Coalinga Well No. 1, redrill. P 5-32.
Approved proposal to redrill, but recommended that 8¼″ water string be tested instead of cementing string of 6¼″ casing.
California Coalinga Well No. 1, test of casing. T 5-72.
Test showed that plug was below shoe of 8¼″ casing instead of inside of casing, as was supposed.
California Coalinga Well No. 1, test of casing. T 5-81.
Test showed leak in 8¼″ casing.
California Coalinga Well No. 1, supplementary redrill. P 5-136.
Approved proposal to redrill 6¼″ oil string and set packer in water string.
California Coalinga Well No. 3, commence drilling. P 5-60.
Proposed depth of water shut-off approved.
Coalinga Security Well No. 1, redrill. P 5-31.
Approved proposal to redrill oil string.
Coalinga Security Well No. 1, redrill. P 5-284.
Approved proposal to redrill oil string.
Coalinga Security Well No. 2, commence drilling. P 5-98.
Proposed depth of water shut-off approved.
Coalinga Security Well No. 3, commence drilling. P 5-61.
Proposed depth of water shut-off approved.
Coalinga Security Well No. 3, shut off. T 5-162.
Test showed that 10″ casing failed to shut off top water. Recommended cementing 8¼″ at about 2793′.
Coalinga Security Well No. 3, cement deeper. P 5-262.
Approved proposal to mud up hole and cement 8¼″ at 2793′.
Coalinga Security Well No. 3, shut off. T 5-177.
Test of water shut-off satisfactory.

SECTION 11.

Southern Pacific Company, Fuel Oil Department.
Well No. 31, production test. T 5-13.
Tests of lead-line samples showed trace of water. Test of water shut-off satisfactory.

SECTION 12.

Wilcox Oil Company.
Well No. 1, abandon. P 5-117.
Approved proposal to plug and pull certain casings, leaving well in such condition that it will be possible to do further work if necessary.
Well No. 1, test of plug. T 5-83.
Location and hardness of cement satisfactory.

Coalinga Mohawk Oil Company.
Well No. 3, shut off. T 5-55.
Test indicated that 6¼″ water string does not shut off water.
Well No. 4, redrill. P 5-133.
Approved proposal to redrill oil string. This cancels prior notice of abandonment.
Well No. 6, redrill. P 5-143.
Approved proposal to redrill oil string.

Coalinga Mohawk Oil Co.—Continued.

Well No. 8, plug bottom. P 5-3.

Approved proposal to plug off bottom water.

Well No. 9, shut off. T 5-47.

Test of water shut-off satisfactory.

Well No. 10, redrill. P 5-142.

Approved proposal to plug back and test upper oil sands above which 8¼" casing was cemented to shut off top water.

Well No. 10, shut off. T 5-132.

6¼" casing cemented at 4215'. Test of water shut-off satisfactory.

Well No. 11, shut off. T 5-110.

Test of water shut-off satisfactory.

SECTION 14.

Kyle and Lewis.

Vancouver California Well No. 1, abandon. P 5-80.

Approved proposal to abandon. This well probably did not encounter productive oil or gas sand.

SECTION 18.

American Petroleum Company.

Well No. 4, production test. T 5-3.

A test of lead-line sample showed that water conditions at this well are unsatisfactory.

Well No. 6, production test. T 5-1.

Test of lead-line sample indicated that packer on oil string shuts out top water.

Well No. 9, production test. T 5-2.

Test of lead-line sample indicates satisfactory water condition.

Well No. 28, deepen. P 5-185.

Approved proposal to mud upper oil sand and cement below intermediate water.

Well No. 28, shut off. T 5-205.

Test of water shut-off satisfactory.

Lakeport Petroleum Company.

Well No. 24, shut off. T 5-99.

Test showed water coming through hole in water string, by running casing tester.

Well No. 24, alter casing. P 5-149.

Approved proposal to set packer on oil string after completion of drilling.

Nevada Petroleum Company.

Well No. 5A, shut off. T 5-36.

Test indicated that water present was coming from oil sand. Recommended that drilling continue, after which a production test would be made.

Well No. 5A, recement. P 5-247.

Approved proposal to recement with 6¼" casing.

Well No. 5A, shut off. T 5-180.

Test of water shut-off satisfactory.

Well No. 5C, redrill. P 5-129.

Approved proposal to redrill oil string. This cancels previous notice to abandon.

SECTION 19.

American Petroleum Company.

Well No. 3, production test. T 5-33.

Test of lead-line samples showed condition of well to be satisfactory.

Well No. 4, redrill. P 5-73.

Recommended that water string be tested and top water be shut off by recementing or setting packer.

Well No. 11, shut off. T 5-30.

Well passed for further drilling and production test.

Southern Pacific Company, Fuel Oil Department.

Well No. 3, production test. A-360.

Test of lead-line sample warranted approval of water condition.

Well No. 38, redrill. P 5-235.

Approved proposal to redrill oil string.

Well No. 55, commence drilling. P 5-336.

Proposed depth of water shut-off approved.

SECTION 20.

Nevada Petroleum Company.

Well No. 1, test for source of water. T 5-89.

Test was made to determine source of water by introducing muddy water into well. Test inconclusive.

Well No. 1, shut off. T 5-141.

Test of 6¼″ casing cemented at 3326′ satisfactory.

Well No. 1, shut off. T 5-154.

After cementing 6¼″ below oil sands at 3327′, well was drilled ahead into bottom water sand and circulation obtained through sand and side-tracked casing, and cement pumped through this opening up to water string. Present hole into bottom water sand plugged with cement. Test of this plug satisfactory.

Well No. 2A, commence drilling. P 5-342.

Recommended cementing at 3205′ instead of 3190′ as proposed.

SECTION 30.

R. L. Patterson.

Creme Petroleum Well No. 1, abandon. P 5-77.

Proposed depths of shooting and plugging approved.

Creme Petroleum Well No. 1, test of plug. T 5-75.

Location and hardness of cement satisfactory.

Creme Petroleum Well No. 2, abandon. P 5-130.

Depths of plugging approved.

Creme Petroleum Well No. 2, test of plugs. T 5-145.

Location and hardness of cement plugs satisfactory.

American Petroleum Company.

Well No. 14, commence drilling. P 5-310.

Recommended cementing at 2230′ instead of 2210′ as proposed. The company's attention was called to the fact that a depth of 2210′ is beyond the safe limit for 10″ 40-lb. water string.

Well No. 15, commence drilling. P 5-309.

Proposed depth of water shut-off approved. Company's attention was called to the fact that a depth of 2225′ is beyond the safe limit for 10″ 40-lb. water string.

Well No. 16, commence drilling. P 5-308.

Proposed depth of water shut-off approved. Company's attention was called to the fact that 2200′ is beyond the safe limit for 10″ 40-lb. water string.

Nevada Petroleum Company.

Well No. 7, redrill. P 5-272.

Approved proposal to repair damaged water string and pump for production test.

Well No. 1A, redrill. P 5-264.

Approved proposal to test 8¼″ water string for leak. If no leak is found, to mud upper oil sand and cement 6¼″ casing below it.

Well No. 5A, production test. T 5-15.

Test of lead-line sample showed an excessive amount of water. Recommended that well be pumped for further test.

Well No. 8A, shut off. T 5-19.

Test of water shut-off satisfactory.

Well No. 8A, redrill. P 5-273.

Approved proposal to bridge and test water string.

SECTION 31.

Southern Pacific Company, Fuel Oil Department.

Well No. 65. Redrill. P 5-111.

Approved proposal to redrill oil string.

T. 21 S., R. 14 E., M.D.B. & M.

SECTION 13.

S. N. Root.

Well No. 1. Test of plugs. T 5-25.

Location and hardness of cement satisfactory.

T. 21 S., R. 15 E., M.D.B. & M.

SECTION 6.

Los Angeles Coalinga Oil Syndicate.

Well No. 1. Abandon. P 5-321.

Approved proposal to abandon, specifying depths of shooting and plugging.

Muriel Oil Company.

Well No. 1. Redrill. P 5-123.

Approved proposal to test water string and oil sands for production.

Well No. 1. Supplementary redrill. P 5-167.

Approved proposal to cement $6\frac{5}{8}''$ casing to shut off top water.

Well No. 1. Shut-off. T 5-124.

Test of water shut-off inconclusive. Recommended further plugging and testing.

Well No. 1. Abandon. P 5-225.

Approved proposal to abandon by pulling casing and mudding well under pressure.

Coalinga Red Top Oil Company.

Well No. 1. Abandon. P 5-174.

Approved proposal to plug and pull a portion of casing.

Well No. 1. Test of plug. T 5-113.

Location and hardness of cement plug satisfactory.

Jefferson Oil Company.

Well No. 2. Deepen. P 5-180.

Approved proposal to deepen and test lower oil sands.

Well No. 2. Supplementary deepen. P 5-202.

Approved proposal to cement in $8\frac{1}{4}''$ liner.

Well No. 2. Shut-off. T 5-159.

Test inconclusive. Approved proposal to drill ahead and make further bailing test.

Well No. 2. Plug bottom. P 5-299.

Approved proposal to plug bottom.

Lucile Oil Company.

Well No. 1. Redrill. P 5-54.

Approved proposal to redrill oil string.

Well No. 1. Redrill. P 5-108.

Approved proposal to remove $4\frac{1}{2}''$ casing and recommended further testing for water shut-off.

Well No. 2. Redrill. P 5-30.

Approved proposal to redrill oil string and test water string.

Well No. 2. Shut-off. T 5-77.

Test of water shut-off satisfactory.

Marian Oil Company.

Well No. 1. Shut-off. T 5-10.

Bailing test inconclusive. Recommended pumping test.

Pacific States Petroleum Company.
  Well No. 2. Redrill. P 5-159.
    Approved proposal to redrill and shut-off water.

SECTION 26.

Bunting Iron Works.
  Azores Oil Company Well No. 1. Redrill. P 5-64.
    Approved proposal to plug, test shut-off, and attempt to produce.
  Azores Well No. 1. Redrill. P 5-148.
    Approved proposal to cement 4½" casing to shut off top water.

T. 21 S., R. 16 E., M.D.B. & M.

SECTION 30.

R. L. Patterson.
  Kaweah Oil Development Co. Well No. 1. Abandon. P 5-228.
    Approved proposal to abandon without plugging.

T. 22 S., R. 16 E., M.D.B. & M.

SECTION 32.

Pine Ridge Petroleum Company.
  Well No. 1. Commence drilling. P 5-300.
    Prospect well.

T. 23 S., R. 16 E., M.D.B. & M.

SECTION 10.

Section 10 Oil Company.
  Well No. 1. Commence drilling. P 5-269.
    Prospect well.

CHAPTER VIII.

DIRECTORY OF OIL OPERATORS.

(Revised to December 1, 1918.)

The date following each name is that of incorporation. The amount of money shown is the authorized capitalization. This information is from the records of the State Board of Equalization.

Star before name indicates that the concern produced oil or gas during the calendar year 1917. The number of wells, followed by the name of a county, means the wells actually producing in said county on December 31, 1917. The information relative to wells, production, and location is from sworn statements filed with the State Mineralogist in 1918, prior to March 14.

This directory contains names of all oil producers, and, in addition, many concerns which are connected with the oil industry, either by mere incorporation or as landowners. It is difficult to correctly list or classify those outside of actual producers.

***A. & J. OIL COMPANY,**
400 H. W. Hellman Bldg., Los Angeles, Cal. A. J. Jergins, President. H. J. Haase, Secretary. April 25, 1914. $80,000. Three wells, Kern County.

ACME OIL AND GAS PRODUCING COMPANY,
1021 American Bank Bldg., San Diego, Cal. April 1, 1918. $25,000.

ÆTNA OIL, MINING AND DEVELOPING COMPANY,
748 Gladys Ave., Los Angeles, Cal. Wm. H. Smith, President. Dwight B. Harris, Secretary. May 14, 1913. $25,000.

ÆTNA PETROLEUM COMPANY,
350 California St., San Francisco, Cal. John Lawson, President. George S. Tyler, Secretary. April 20, 1899. $50,000 Orig. $500,000 Inc.

ALADDIN OIL COMPANY,
409 Consolidated Realty Bldg., Los Angeles, Cal. Wm. Mead, President. L. Schenck, Secretary. September 17, 1900. $250,000. Kern County.

***ALASKA PIONEER OIL COMPANY,**
264 Southern Pacific Bldg., San Francisco, Cal. Wm. Chappell, President. W. J. Clark, Secretary. March 18, 1910. $500,000. Six wells, Kern County.

ALLIANCE OIL COMPANY,
354 Pine St., San Francisco, Cal. L. A. Phillips, President. H. P. Coles, Secretary. July 22, 1909. $3,000,000.

***ALMA OIL COMPANY,**
517 Pacific Bldg., Oakland, Cal. C. E. Thomas, President. M. A. Thomas, Secretary. June 22, 1900. $400,000. Eighteen wells, Kern County.

ALMO OIL COMPANY,
Lemoore, Cal. L. H. Byron, President. L. L. Follett, Secretary. June 23, 1904. $50,000.

ALTOONA MIDWAY OIL COMPANY,
Room 72, Altoona Trust Bldg., Altoona, Pa. R. W. A. Jamison, President. J. H. Fiske, Secretary. February 20, 1909. $500,000. Kern County.

ALVARADO OIL COMPANY,
1114 Union Oil Bldg., Los Angeles, Cal. L. H. Mitchell, President; V. C. McCollogh, Secretary. February 23, 1904. $300,000.

***AMALGAMATED OIL COMPANY,**
55 New Montgomery St., San Francisco, Cal. Wm. Sproule, President. P. G. Williams, Secretary. October 27, 1904. $5,000,000. Thirty wells, Orange County; six wells, Los Angeles County.

AMAZON OIL COMPANY,
410 Citizens Savings Bank Bldg., Pasadena, Cal. A. K. Nash, President. R. H. Pinney, Secretary. September 26, 1900. $400,000. Kern County.

AMBER OIL COMPANY,
803 Baker St., East Bakersfield, Cal. John Kincaid, President. S. K. Dickinson, Secretary. July 19, 1900. $500,000. Kern County.

***AMERICAN CRUDE OIL COMPANY,**
Room 1115, 456 S. Spring St., Los Angeles, Cal. Wm. Fitzherbert West, President. January 3, 1912. $500,000. Nine wells, Kern County.

***AMERICAN OILFIELDS COMPANY,**
1034 Security Bldg., Los Angeles, Cal. I. M. Fuqua, Vice President. Norman Bridge, Secretary. January 10, 1910. $25,000,000. Forty-five wells, Kern County.

AMERICAN PACIFIC OIL AND REFINING COMPANY,
333 Van Nuys Bldg., Los Angeles, Cal. July 12, 1918. $100,000.

***AMERICAN PETROLEUM COMPANY,**
1034 Security Bldg., Los Angeles, Cal. W. D. Stewart, Vice President. Norman Bridge, Secretary. February 7, 1908. $10,000,000, Orig.; $15,000,000, Inc. Ninety-two wells, Fresno County.

***AMERICAN VENTURA OIL COMPANY (Arizona Corporation),**
452 I. W. Hellman Bldg., Los Angeles, Cal. J. M. Herndon, President. J. C. Miller, Secretary. Ventura County.

***AMITY OIL COMPANY,**
607 First National Bank Bldg., San Francisco, Cal. R. H. Smith, President. A. Whearty, Secretary. August 31, 1911. $500,000. Six wells, Fresno County.

***AMY OIL COMPANY,**
Box 28, Coalinga, Cal. A. P. May, President. C. E. Haliburton, Secretary. November 14, 1908. $50,000. One well, Fresno County.

*ANCHOR OIL COMPANY,
Maricopa, Cal. Jules H. Preston, President. Bernard T. Lennon, Secretary. January 19, 1917. $300,000. Fourteen wells, Kern County.

ANGLO-CALIFORNIAN OIL SYNDICATE, LIMITED,
Care W. J. Packard, Bank of Lompoc Bldg., Lompoc, Cal. John Chapman, President. G. J. Stimson, Secretary. July 17, 1906. £50,000.

*APOLLO OIL COMPANY,
507 Foxcroft Bldg., San Francisco, Cal. Wm. E. Miles, President. A. J. Weston, Secretary. February 13, 1901. $20,000. Nineteen wells, Kern County.

*ARCTURUS OIL COMPANY,
55 New Montgomery St., San Francisco, Cal. Wm. Sproule, President. P. G. Williams, Secretary. February 12, 1904. $400,000. Twenty-five wells, Los Angeles County.

AREQUIPA OIL COMPANY,
245 Holbrook Bldg., San Francisco, Cal. O. Scribner, President. G. Sheridan, Secretary. January 5, 1909. $500,000. Kern County.

*ARICA OIL COMPANY,
55 New Montgomery St., San Francisco, Cal. Wm. Sproule, President. P. G. Williams, Secretary. January 5, 1909. $500,000. Twelve wells, Fresno County.

ARIZONA OIL COMPANY,
824 Crocker Bldg., San Francisco, Cal. T. C. Petersen, General Manager. July 20, 1918. $2,500,000. (Formerly Peerless Oil Company.)

*ARIZONA PETROLEUM COMPANY,
1122 Title Insurance Bldg., Los Angeles, Cal. J. A. Brown, President. E. W. Forgy, Secretary. March 13, 1910. $250,000. Seven wells, Fresno County. (From June to August, 1918, property operated by Harris & Cates. From September, 1918, property operated by C. B. Cates & Co.)

*ASSOCIATED OIL COMPANY,
55 New Montgomery St., San Francisco, Cal. Paul Shoup, President. P. G. Williams, Secretary. October 7, 1901. $40,000,000. Sixty-three wells, Fresno County; 712 wells, Kern County; 5 wells, Santa Barbara County.

ASSOCIATED OIL COMPANY OF NEVADA,
55 New Montgomery St., San Francisco, Cal. Wm. Sproule, President. P. G. Williams, Secretary. October 2, 1916. $25,000.

ATLANTIC AND WESTERN OIL COMPANY,
Livermore, Cal. Wm. W. French, Agent. September 14, 1917. $1,000,000.

ATLAS CRUDE OIL COMPANY,
Title Insurance Bldg., Los Angeles, Cal. G. M. Giffen, President. Theo. A. Simpson, Secretary. July 14, 1900. $30,000.

ATLAS DEVELOPMENT COMPANY,
1351 E. 26th St., Oakland, Cal. L. A. Moberry, President. J. Somers, Secretary. January 11, 1918. $15,000.

AUGUST OIL COMPANY,
P. O. Box 635, Fresno, Cal. F. A. Homan, President. A. W. Burdick, Secretary. April 4, 1910. $1,000,000.

*AUGUSTINE & BUTZ,
Coalinga, Cal. Six wells, Fresno County.

AVENAL LAND AND OIL COMPANY,
350 California St., San Francisco, Cal. John Lawson, President. R. D. Blake, Secretary. April 20, 1899 $500,000.

AZORES OIL COMPANY,
206 N. Douty St., Hanford, Cal. M. J. Caetana, President. Wilhelmina Nunes, Secretary. January 20, 1909. $50,000.

BABY KINGS OIL AND MINERAL COMPANY,
P. O. Box 416, Hanford, Cal. F. B. Skinner, President. W. R. McQuiddy, Secretary. December 8, 1897. $64,000.

*BAKER & HENSHAW,
Lost Hills, Cal. Two wells, Kern County.

BAKERSFIELD AND FRESNO OIL COMPANY,
Care F. E. Cook, Box 688, Fresno, Cal. H. M. Rodgers, President. F. E. Cook, Secretary. August 31, 1899. $100,000. Kern County.

BAKERSFIELD FUEL AND OIL COMPANY,
1805 Tucker St., Selma, Cal. W. H. Shafer, President. Chas. A. Lee, Secretary. July 31, 1899. $16,000.

BALBOA OIL COMPANY,
525 Spreckels Bldg., San Diego, Cal. A. J. Taylor, President. J. Wiseman, Secretary. June 10, 1912. $500,000.

BALD EAGLE JUNIOR OIL COMPANY,
P. O. Box 308, Napa, Cal. E. H. Winship, President. J. E. Beard, Secretary. February 1, 1901. $175,000.

*BALD EAGLE OIL COMPANY,
110 Sutter St., San Francisco, Cal. Geo. M. Brown, President. Allie G. Lange, Secretary. January 7, 1901. $500,000. Thirteen wells, Kern County.

BALDWIN-STOCKER OIL ESTATES,
414 Merritt Bldg., Los Angeles, Cal. One well, Los Angeles County.

*BANKERS OIL COMPANY,
703 Citizens National Bank Bldg., Los Angeles, Cal. Orra E. Monnette, President. M. J. Monnette, Secretary. November 24, 1909. $1,000,000. Thirty-four wells, Kern County.

*BANKLINE OIL COMPANY,
324 Sansome St., San Francisco, Cal. John Barneson, President. J. Leslie Barneson, Secretary. May 20, 1912. $200,000. Twenty-one wells, Kern County.

BANNER OIL COMPANY,
520 Union Oil Bldg., Los Angeles, Cal. J. H. Strine, President. Ruben S. Schmidt, Secretary. September 12, 1891. $10,000.

BARDSDALE CANYON OIL COMPANY,
300 S. Harvard Blvd., Los Angeles, Cal. Chas. F. Hurd, President. Thos. Pascoe, Secretary. May 16, 1901. $20,000. (Dissolved.)

***BARDSDALE CRUDE OIL COMPANY,**
514 Federal Bldg., Los Angeles, Cal. A. F. Schiffman, President. Chas. A. Shaw, Secretary. June 18, 1900. $200,000. Eight wells, Ventura County.

BARNODON OIL COMPANY,
310 Sansome St., San Francisco, Cal. John Barneson, President. W. J. Dinsmore, Secretary. April 9, 1910. $1,000,000.

BARSTOW SAN ANTONIO OIL COMPANY,
9 Beech St., Detroit, Michigan, care W. L. Hogan. January 16, 1915. $100,000.

BARTOLO OIL COMPANY,
1124 Merchants National Bank Bldg., Los Angeles, Cal. L. P. Tappeiner. President. G. C. O'Connell, Secretary. August 7, 1916. $100,000.

BAY CITY OIL COMPANY,
30 S. Raymond Ave., Los Angeles, Cal. J. H. Dorn, President. Ira J. H. Sykes, Secretary. October 28, 1899. $500,0000. Kern County.

BEAR CREEK OIL COMPANY,
19 Howard Canfield Bldg., Santa Barbara, Cal. J. A. Hurlburt, President. A. R. Edmondson, Secretary. July 12, 1913. $10,000.

***BEATTY OIL AND DEVELOPMENT COMPANY,**
930 California Bldg., Los Angeles, Cal. S. W. Beatty, President. H. M. Foster, Secretary. February 10, 1913. $470,000. Two wells, Ventura County.

***G. F. BECKER,**
Summerland, Cal. Sixty-four wells, Santa Barbara County.

BED ROCK OIL COMPANY,
1114 Union Oil Bldg., Los Angeles, Cal. W. W. Orcutt, President. John McPeak, Secretary. January 4, 1909. $50,000.

***BEER OIL COMPANY, J. C.,**
407 First National Bank Bldg.. Long Beach, Cal. J. C. Beer, President. H. Hoddenpyle, Secretary. March 23. 1912. $100,000. Three wells, Kern County. (Property now operated by E. B. Campbell, Bakersfield, Cal.)

BELL OF MONTEBELLO OIL COMPANY,
318 H. W. Hellman Bldg., Los Angeles, Cal. November 25, 1918. $100,000.

BELL OIL COMPANY,
303 Fay Bldg., Los Angeles, Cal. C. E. Lapp, President. J. W. Eberle, Secretary. July 2, 1910. $100,000.

BELMONT OIL COMPANY,
601 D St., Chino, Cal. O. J. Newman, President. Edwin Rhodes, Secretary. September 13, 1899. $200,000.

***BELRIDGE OIL COMPANY,**
617 Merritt Bldg., Eighth and Broadway, Los Angeles, Cal. Burton E. Green, President. F. B. Sutton, Secretary. January 25, 1911. $1,000,000. Eighty wells, Kern County.

BEQUETTE OIL COMPANY,
Visalia, Cal. Paschal Bequette, President. N. F. Bradley, Secretary. January 16, 1900. $9,000.

***BERKELEY COALINGA OIL COMPANY,**
Care of W. L. W. Miller, 340 California St., San Francisco, Cal. Fresno County.

BERKELEY PARAFFINE OIL COMPANY,
1804 Grant St., Berkeley, Cal. Geo. H. DeKay, President. J. H. Allen, Secretary. July 6, 1912. $1,000,000.

***BERRY, F. C.,**
Selma, Cal. Five wells, Kern County.

***BERRY, C. J., and KELLER, F. L.,**
597 Monadnock Bldg., San Francisco, Cal. Eighteen wells, Kern County.

BEST YET OIL COMPANY, THE,
Box 187, Coalinga, Cal. O. D. Loftus, President. Guy H. Salisbury, Secretary. October 29, 1909. $150,000.

***BETTS, GEORGE A.,**
R. F. D. No. 5, Bakersfield, Cal. Seven wells, Kern County.

***B. H. C. OIL COMPANY,**
208 Brower Bldg., Bakersfield, Cal. C. L. Claflin, President. W. H. Hill, Secretary. September 18, 1908. $15,000. Six wells, Kern County.

***BIG SESPE OIL COMPANY OF CALIFORNIA,**
609 N. Main St., Santa Ana, Cal. L. A. Clampitt, President. I. D. Mills, Secretary. September 4, 1896. $500,000. Two wells, Ventura County.

***BIRCH OIL COMPANY,**
R. F. D., Fullerton, Cal. A. Otis Birch, General Manager. Ten wells, Orange County. (Copartnership.)

***BLANCK & HEASLEY,**
Care of Lawton & Blanck, Inc., Fellows, Cal. Two wells, Kern County.

BLUE DIAMOND OIL COMPANY,
Grass Valley, Cal. W. G. Thomas, President. L. P. Larue, Secretary. October 15, 1900. $100,000.

J. S. BOOK OIL AND INVESTMENT COMPANY,
521 Washington Bldg., Los Angeles, Cal. Dr. W. P. Book, President. G. E. Delavan, Jr., Secretary. February 8, 1913. $50,000.

***BOSTON PACIFIC OIL COMPANY,**
204-5 Sharon Bldg., San Francisco, Cal. Fred. G. King, President. E. B. Cushman, Secretary. December 12, 1911. $1,000,000. Two wells, Kern County.

***BOSTON PETROLEUM COMPANY,**
131 State St., Boston, Mass. Arthur Winslow, President. Henry L. Rand, Secretary. March 21, 1910. $500,000. Seventeen wells, Kern County.

BOYCHESTER OIL COMPANY,
Care of J. A. Fleutsch, Secretary, Coalinga, Cal. W. C. Rielly, President. May 19, 1909. $100,000.

***BRAD OIL COMPANY, LTD.,**
Box 178, Taft, Cal. E. D. Taylor, Secretary. One well, Kern County. (Property sold to Montana-Wyoming Oil Company, October 11, 1917.)

BRADFORD OIL COMPANY,
110 Market St., Room 405, San Francisco, Cal. P. G. Goode, Vice President. Louis Nathan, Secretary. May 17, 1899. $250,000.

***BREA CANON OIL COMPANY,**
1117 Trust and Savings Bank Bldg., Los Angeles, Cal. Dan Murphy, President. G. Holterhoff, Jr., Secretary. July 26, 1899. $200,000. Twenty-two wells, Orange County.

BRICELAND OIL COMPANY,
Briceland, Cal. J. W. Bowden, President. W. E. Smith, Secretary. April 22, 1913. $150,000.

BRITISH AMERICAN OIL COMPANY,
Box 598, Santa Monica, Cal. Frank R. Strong, President. Roy Jones, Secretary. August 26, 1907. $1,250,000, Orig.; $100,000. Dec. Kern County.

BRONCHO OIL COMPANY,
9 Main St., San Francisco, Cal. Chas. A. Son, President. A. N. Baldwin, Secretary. November 19, 1908. $100,000.

***BRONCHO OIL LEASE,**
801 Garland Bldg., Los Angeles, Cal. Wm. G. Kerckhoff, Owner. One well, Kern County.

***BROOKS OIL COMPANY,**
519 California St., Room 308, San Francisco, Cal. B. F. Brooks, President. C. L. Brooks, Secretary. October 2, 1908. $500,000. One well, Santa Barbara County.

***BROOKSHIRE OIL COMPANY,**
San Luis Obispo, Cal. J. W. Barneberg, President. Henry Bahr, Secretary. December 1, 1902. $500,000. Two wells, Kern County; four wells, Santa Barbara County.

BROWN EAGLE OIL COMPANY,
300 E. Main St., Visalia, Cal. John Frans, President. J. Sub Johnson, Secretary. February 10, 1910. $75,000.

BROWN OIL COMPANY,
Care Southern Hotel, Bakersfield, Cal. P. S. Brown, President. S. L. Mack, Secretary. January 29, 1900. $250,000.

***BUENA FE PETROLEUM COMPANY,**
1015 Security Bldg., Los Angeles, Cal. W. D. Stewart, President. E. L. Doheny, Jr., Secretary. November 3, 1915. $10,000. Fifty-three wells, Kern County. (Property transferred to Pan American Petroleum Company, October 18, 1917.)

BUENA VISTA OIL COMPANY,
519 Story Bldg., 610 S. Broadway, Los Angeles, Cal. J. M. McLeod, President. C. C. Barnsback, Secretary. July 23, 1914. $1,500,000. Kern County.

BUICK OIL COMPANY,
520 Central Bldg., Los Angeles, Cal. W. J. Fabling, Vice President. Fred Van Orman, Secretary. March 7, 1910. $5,000,000. Kern County.

BULL DOG OIL COMPANY,
617 Merritt Bldg., Los Angeles, Cal. M. H. Whittier, President. H. L. Westbrook, Secretary. March 6, 1911. $300,000.

BUNKER HILL OIL MINING COMPANY,
110 Sutter St., San Francisco, Cal. J. W. Wright, President. B. T. Harrington, Secretary. November 9, 1899. $500,000. Kern County.

E. D. BURGE OIL COMPANY,
P. O. Box 813, Bakersfield, Cal. E. D. Burge, President. C. H. Franey, Secretary. December 11, 1914. $50,000.

***CALEX OIL COMPANY,**
1913 Chester Ave., Bakersfield, Cal. H. A. Jastro, President. E. S. St. Clair, Secretary. August 23, 1915. $24,000. Kern County.

***CALIDON PETROLEUM SYNDICATE,**
350 California St., San Francisco, Cal. Two wells, Kern County. (Operated by the Balfour-Guthrie Investment Company, R. F. MacLeod, Secretary.)

CALIENTE OIL AND LAND COMPANY,
307 Grant Bldg., Los Angeles, Cal. Geo. C. Fetterman, President. July 17, 1916. $50,000.

CALIFORNIA COALINGA OIL COMPANY,
Monadnock Bldg., San Francisco, Cal. Care Wm. H. H. Hart. March 27, 1917. $3,000,000. Fresno County. (Dissolved.)

***CALIFORNIA COAST OIL COMPANY,**
1114 Union Oil Bldg., Los Angeles, Cal. W. L. Stewart, President. John McPeak, Secretary. September 10, 1903. $200,000. Nine wells, Santa Barbara County.

***CALIFORNIA COUNTIES OIL COMPANY,**
58 Sutter St., San Francisco. J. E. Woodbridge, President. E. A. Richards, Secretary. February 11, 1911. $500,000. Kern County. (Sold to General Petroleum Corporation, August 1, 1917.)

CALIFORNIA-DAKOTA OIL COMPANY,
Kerman, Cal. R. C. Heims, President. Walter L. Hart, Secretary. October 27, 1913. $25,000.

CALIFORNIA FRESNO OIL COMPANY,
Box 823, Fresno, Cal. A. C. Ruschhaupt, President. A. Bultner, Secretary. October 31, 1901. $50,000.

CALIFORNIA MIDWAY OIL COMPANY,
500 H. W. Hellman Bldg., Los Angeles, Cal. B. W. McCausland, President. J. H. Nolan, Secretary. January 13, 1912. $1,500,000. Kern County.

CALIFORNIA MISSOURI PETROLEUM COMPANY,
108 Morgan Bldg., Bakersfield, Cal. Care Thomas Scott. December 17, 1917. $100,000. (Dissolved.)

***CALIFORNIA OIL COMPANY,**
532 Fifteenth St., Oakland, Cal. B. B. Dudley, President. E. R. Arner, Secretary. September 28, 1917. $4,000,000. Eighteen wells, Kern County; 6 wells, San Luis Obispo County.

CALIFORNIA OIL COMPANY,
516 Grant Bldg., Los Angeles, Cal. June 7, 1901. $1,000,000. (Company revived by Secretary of State, August 16, 1918.)

CALIFORNIA OIL AND ASPHALT COMPANY, THE,
304 Grosse Bldg., Los Angeles, Cal. May 5, 1916. $50,000.

***CALIFORNIA OIL AND GAS COMPANY,**
Box B-2, Coalinga, Cal. W. M. Graham, President. Warren H. Spurge, Secretary. February 9, 1912. $1,000,000. Four wells, Fresno County.

CALIFORNIA OIL DEVELOPMENT SYNDICATE,
326 Wilcox Bldg., Los Angeles, Cal. J. D. Miller, President. Janet I. Miller, Secretary. November 15, 1916. $3,000.

CALIFORNIA OIL LAND COMPANY, THE,
2002 Hobart Bldg., San Francisco, Cal. A. F. Burke, President. L. T. Young, Secretary. May 17, 1912. $50,000.

CALIFORNIA RELIANCE OIL COMPANY,
317 Tajo Bldg., Los Angeles, Cal. Thurston Daniels, President. Minnie Daniels, Secretary. April 11, 1910. $1,500,000.

***CALIFORNIA STAR OIL COMPANY,**
1004 Security Bldg., Los Angeles, Cal. M. H. Whittier, President. Ellis T. Yarnell, Secretary. May 20, 1915. $2,000,000. Thirty-four wells, Kern County.

CALIFORNIA WYOMING OIL COMPANY,
102 Taylor Bldg., Bakersfield, Cal. E. U. Combs, President. J. B. Johnson, Secretary. April 10, 1917. $3,000.

CALIZONA OIL COMPANY,
509 Hibernian Bldg., Los Angeles, Cal. March 8, 1918. $1,000,000.

***CALL OIL COMPANY,**
1927 Mariposa St., Fresno, Cal. D. A. Ewing, President. W. O. Miles, Secretary. January 8, 1901. $250,000. Three wells, Fresno County.

***CALLOMA OIL COMPANY,**
1913 Chester Ave., Bakersfield, Cal. H. A. Jastro, President. E. S. St. Clair, Secretary. February 15, 1904. $200,000. Kern County.

***CALOKLA OIL COMPANY,**
537 Title Insurance Bldg., Los Angeles, Cal. H. F. Sinclair, President. E. M. Riese, Secretary. November 5, 1913. $250,000. Three wells, Orange County.

CALTRONA OIL COMPANY,
409 Hosfield Bldg., Los Angeles, Cal. Herman P. Cortelyou, President. John W. Cooke, Secretary. January 10, 1907. $8,000.

***CALUMET OIL COMPANY,**
517 I. W. Hellman Bldg., Los Angeles, Cal. F. L. Wright, President. A. N. Gage, Secretary. April 7, 1911. $1,000-000. Seven wells, Ventura County.

CAMARILLO OIL COMPANY,
210 W. Seventh St., Los Angeles, Cal. H. J. Doulton, President. L. N. Stott, Secretary. April 22, 1910. $100,000.

CAMERON OIL COMPANY OF CALIFORNIA,
402 Laughlin Bldg., Los Angeles, Cal. D. F. Lehigh, President. J. O. Lehigh, Secretary. April 23, 1914. $25,000.

CAMPBELL, E. B.,
Bakersfield, Cal. (Operating property of J. C. Beer Oil Company.)

***CANADIAN COALINGA OIL COMPANY, LTD.,**
739 Hastings St., West, Vancouver, B. C. E. J. McFeely, President. R. J. Cromie, Secretary. October 10, 1910. $1,500,000. One well, Fresno County. A. J. Pollak, Agent, Mills Bldg., San Francisco, Cal.

***CANADIAN PACIFIC OIL COMPANY OF BRITISH COLUMBIA, LTD.,**
P. O. Box 27, Taft, Cal. W. H. Waddell, Field Manager. Three wells, Kern County.

CANTIN LAND, OIL AND DEVELOPMENT COMPANY,
68 Post St., San Francisco, Cal. A. A. Cantin, President. L. B. O'Farrell, Secretary. February 8, 1910. $10,000.

***CAPITOL CRUDE OIL COMPANY,**
637 Consolidated Realty Bldg., Los Angeles, Cal. M. H. Sherman, President. A. I. Smith, Secretary. April 26, 1894. $300,000. Twelve wells, Ventura County.

***CARBO PETROLEUM COMPANY,**
Box 34, Bakersfield, Cal. T. M. Young, President. G. R. Peckham, Secretary. July 15, 1909. $500,000. Ten wells, Kern County.

***CARIBOU OIL MINING COMPANY,**
264 Southern Pacific Bldg., San Francisco, Cal. H. H. Hart, President. W. J. Clark, Secretary. June 3, 1899. $1,000,000. Twenty-two wells, Fresno County; 3 wells, Kern County.

***CARPENTER, JACK,**
Maricopa, Cal. H. C. Treat, Manager. Two wells, Kern County.

CARREC OIL COMPANY,
264 Southern Pacific Bldg., San Francisco, Cal. H. H. Hart, President. W. J. Clark, Secretary. September 25, 1914. $100,000.

CARRIE NATION OIL COMPANY,
Lemoore, Cal. L. Y. Trout, President. F. B. Graves, Secretary. December 23, 1908. $25,000.

CASCADE OIL COMPANY,
805 Hollingsworth Bldg., Los Angeles, Cal. H. A. Dunn, President. F. R. Campbell, Secretary. April 28, 1916. $10,000.

***CASMALIA SYNDICATE,**
55 New Montgomery St., San Francisco, Cal. Wm. Sproule, President. P. G. Williams, Secretary. March 30, 1916. $1,000,000. Seven wells, Santa Barbara County.

CASTLE OIL COMPANY,
1118 Hearst Bldg., San Francisco, Cal. H. A. Whitley, President. J. R. Whitmire, Secretary. March 19, 1910. $600,000.

CATES & CO., C. B. (See Harris & Cates).
701 College Ave., Los Angeles, Cal. (Operating Strong Oil Lease, and Arizona Petroleum Lease, since September, 1918.)

CAVE DALE OIL AND DEVELOPMENT COMPANY,
1332 Evans Ave., San Francisco, Cal. S. Pliser, President. H. Saxi, Secretary. December 8, 1914. $200,000.

CENTRAL CALIFORNIA OIL COMPANY,
1114 Union Oil Bldg., Los Angeles, Cal. Frank R. Barrett, President. May 22, 1886. $200,000.

***CENTRAL OIL COMPANY OF LOS ANGELES,**
404 H. W. Hellman Bldg., Los Angeles, Cal. I. A. Lothian, President. Robert N. Bulla, Secretary. January 2, 1900. $750,000, Orig.; $3,000,000, Inc. Fifty-two wells, Los Angeles County.

***CHANSLOR-CANFIELD MIDWAY OIL COMPANY,**
Room 756, Kerckhoff Bldg., Los Angeles, Cal. E. P. Ripley, President. G. Holterhoff, Jr., Secretary. August 15, 1901. $5,000,000. One hundred eighty-nine wells, Kern County.

***CHENEY STIMSON OIL COMPANY,**
518 Investment Bldg., Los Angeles, Cal. A. L. Cheney, President. December 17, 1909. $100,000. Six wells, Kern County. (Company changed name to Five Star Oil Company, July 5, 1918.)

CHEROKEE DEVELOPMENT COMPANY,
Care of J. N. Bingham, P. O. Box 388, Fresno, Cal.

CHINO OIL COMPANY,
224 H. W. Hellman Bldg., Los Angeles, Cal. E. J. Marshall, President. John F. Horton, Secretary. October 18, 1907. $50,000.

C. H. OIL COMPANY,
264 Southern Pacific Bldg., San Francisco, Cal. Wm. Chappell, President. W. J. Clark, Secretary. December 5, 1911. $100,000.

***CIRCLE OIL COMPANY,**
502 Balboa Bldg., San Francisco, Cal. T. A. O'Donnell, President. O. G. Myers, Secretary. April 10, 1908. $100,000. One well, Fresno County.

***CLAMPITT, E. A.,**
1037 N. Alameda St., Los Angeles, Cal. Twenty-six wells, Kern County; 39 wells, Los Angeles County.

***CLAMPITT, E. A. & D. L.,**
1037 N. Alameda St., Los Angeles, Cal. Nine wells, Los Angeles County.

***CLAREMONT OIL COMPANY,**
1114 Union Oil Bldg., Los Angeles; Cal. W. L. Stewart, President. R. Bruce Wallace, Secretary. January 25, 1901. $100,000. Five wells, Fresno County; 13 wells, Kern County.

COALINGA CENTRAL OIL COMPANY,
1913 Chester Ave., Bakersfield, Cal. E. S. St. Clair, President. F. C. St. Clair, Secretary. April 9, 1910. $600,000.

COALINGA CROWN OIL COMPANY,
Temple Bar Bldg., Fresno, Cal. A. M. Drew, Secretary. September 17, 1909. $300,000.

***COALINGA EMPIRE OIL COMPANY,**
1118 Hearst Bldg., San Francisco, Cal. H. A. Whitley, President. Stanley Pedder, Secretary. October 28, 1914. $1,000,000. Fresno County.

COALINGA FOUR OIL COMPANY,
1034 Security Bldg., Los Angeles, Cal. T. A. O'Donnell, President. R. L. Peeler, Secretary. May 8, 1907. $50,000.

COALINGA HOMESTAKE OIL COMPANY,
Box 463, Coalinga, Cal. A. P. May, President. Geo. E. H. Satchell, Secretary. July 29, 1909. $100,000. Fresno County.

COALINGA LOST HILLS OIL COMPANY,
1034 Security Bldg., Los Angeles, Cal. R. C. Baker, President. R. L. Peeler, Secretary. January 4, 1911. $50,000.

***COALINGA LUBRICATING OIL COMPANY,**
403 Citizens National Bank Bldg., Los Angeles, Cal. R. A. Collins, President. G. H. Rathman, Secretary. January 27, 1917. $100,000. Three wells, Fresno County.

***COALINGA MOHAWK OIL COMPANY,**
611 Balboa Bldg., San Francisco, Cal. Alfred L. Meyerstein, President. E. Tourtellot, Secretary. April 15, 1907. $500,000. Four wells, Fresno County.

***COALINGA MONTEREY OIL COMPANY,**
201 Main St., Salinas, Cal. E. A. Nickerson, President. Luther Rodgers, Secretary. March 17, 1910. $2,000,000. Three wells, Kern County.

***COALINGA NATIONAL PETROLEUM COMPANY,**
310 Sansome St., San Francisco, Cal. John Barneson, President. Virgil F. Shaw, Secretary. May 8, 1909. $500,000. One well, Fresno County.

***COALINGA NORTH POLE OIL COMPANY,**
Box 692, Fresno, Cal. W. B. Holland, President. L. W. Wilson, Secretary. October 2, 1909. $50,000. Fresno County.

***COALINGA PACIFIC OIL AND GAS COMPANY,**
607 First National Bank Bldg., San Francisco, Cal. Robert Hays Smith, President. A. Whearty, Secretary. August 4, 1903. $165,000. Two wells, Fresno County.

COALINGA PEERLESS OIL COMPANY,
824 Crocker Bldg., San Francisco, Cal. Gordon Bradley, Assistant Secretary. (Property sold to Standard Oil Company.)

***COALINGA PETROLEUM COMPANY,**
Coalinga, Cal. A. A. Baker, Secretary. January 23, 1905. $75,000. Six wells, Fresno County.

COALINGA SECURITY OIL COMPANY, THE,
919 Investment Bldg., Los Angeles, Cal. F. E. Woodruff, President. C. H. McWilliams, Secretary. February 25, 1910. $300,000. Fresno County (Property leased to Union Oil Company.)

***COALINGA STAR OIL COMPANY,**
1004 Security Bldg., Los Angeles, Cal. Thos. A. O'Donnell, President. Ellis T. Yarnell, Secretary. May 10, 1916. $200,000. Eleven wells, Fresno County.

***COALINGA SYNDICATE OIL COMPANY,**
433 California St., San Francisco, Cal. H. U. Maxfield, President. A. E. Boynton, Secretary. June 28, 1911. $2,500,000. Two wells, Fresno County.

***COALINGA UNITY OIL COMPANY,**
55 New Montgomery St., San Francisco, Cal. A. C. McLaughlin, President. P. G. Williams, Secretary. September 24, 1909. $200,000. Four wells, Fresno County.

COAST RANGE OIL COMPANY,
701 Washington Bldg., Los Angeles, Cal. Mary B. Cates, President. Alton M. Cates, Secretary. May 10, 1890. $1,000,000, Orig.; $10,000, Dec. Fresno County.

***COHN & O'CONNOR,**
Fillmore, Cal. Five wells, Ventura County.

COLONIA OIL COMPANY OF OXNARD, CALIFORNIA,
Box A, Oxnard, Cal. A. Levy, President. R. W. Witman, Secretary. September 13, 1909. $200,000.

***COLORADO OIL COMPANY,**
Care Merchants National Bank, San Diego, Cal. Ralph Granger, President. J. E. Hasbrouck, Secretary. December 22, 1909. $200,000. Fourteen wells, Los Angeles County.

COLORADO-PACIFIC DEVELOPMENT COMPANY,
337 Deseret News Annex, Salt Lake City, Utah. J. H. Hunt, President. L. A. Maison, Secretary. December 5, 1907. $1,000,000. (Dissolved.)

***COLUMBIA OIL PRODUCING COMPANY,**
303 Tajo Bldg., Los Angeles, Cal. W. B. Scott, President. W. Astley, Secretary. May 28, 1900. $3,500,000. Sixty wells, Orange County; 44 wells, Los Angeles County.

COLUMBUS MIDWAY OIL COMPANY,
341 Montgomery St., San Francisco, Cal. January 18, 1910. $1,000,000. (Revived by Secretary of State, September 18, 1918.)

***COMBINED OIL COMPANY, THE,**
1106 Hobart Bldg., San Francisco, Cal. Philip C. Boardman, President. George J. Hausen, Secretary. May 29, 1911. $500,000. Seven wells, Kern County.

***COMMERCIAL PETROLEUM COMPANY,**
120 Market St., San Francisco, Cal. M. L. Woy, President. W. P. Roth, Secretary. July 27, 1896. $250,000. Eight wells, Fresno County.

COMSTOCK CRUDE OIL COMPANY,
421 Kerckhoff Bldg., Los Angeles, Cal. L. N. Comstock, President. N. J. Hudson, Secretary. November 2, 1912. $500,000.

***CONFIDENCE OIL COMPANY,**
Box 867, Fresno, Cal. D. S. Ewing, President. A. W. Burdick, Secretary. May 13, 1899. $48,000. Seven wells, Fresno County.

CONSERVATIVE DEVELOPMENT COMPANY,
319 Wilcox Bldg., Los Angeles, Cal., care C. E. Price. L. W. Myers, President. C. E. Price, Secretary. February 27, 1903. $200,000, Orig.; $20,000, Dec.

***CONSERVATIVE OIL COMPANY,**
2223 Nineteenth St., Bakersfield, Cal. C. Brubacher, President. E. L. Schultz, Secretary. March 1, 1905. $62,500. Two wells, Kern County.

***CONSOLIDATED MUTUAL OIL COMPANY,**
544 Market St., San Francisco, Cal. Louis Titus, President. C. F. Nance, Secretary. February 16, 1914. $3,000,000. Fourteen wells, Kern County.

CONSOLIDATED OIL AND DEVELOPMENT COMPANY,
519 California St., San Francisco, Cal. Dr. L. M. F. Wanzer, President. H. L. Grunzburger, Secretary. August 14, 1896. $50,000.

***CONSOLIDATED OIL LANDS COMPANY,**
433 California St., San Francisco, Cal. Chas. W. Gardner, President. A. E. Boynton, Secretary. April 27, 1911. $5,000,000. Two wells, Fresno County.

CONTINENTAL OIL AND MINERAL COMPANY,
1055 Market St., San Francisco, Cal. M. Spiegleman, President. E. J. Long, Secretary. July 14, 1914. $100,000. Santa Clara County. (Property now operated by Rhoads & Schmitt.)

CONTINENTAL OIL COMPANY OF LOS ANGELES,
Care C. E. Price, Wilcox Bldg., Los Angeles, Cal. A. D. Elwell, President C. E. Price, Secretary. December 16, 1899. $300,000.

CONTINENTAL PETROLEUM COMPANY,
Sharon Bldg., San Francisco, Cal. December 15, 1907. $200,000.

CONTRA COSTA OIL SYNDICATE,
424 Phelan Bldg., San Francisco, Cal. R. R. Veale, President. B. Schapiro, Secretary. October 20, 1917. $100,000.

COPA DE ORO PETROLEUM COMPANY,
600 Chicago Ave., Riverside, Cal. K. D. Harger, President. H. D. French, Secretary. December 12, 1914. $450,000.

COPECK OIL COMPANY,
310 Sansome St., San Francisco, Cal. John Barneson, President. J. Leslie Barneson, Secretary. January 8, 1909. $500,000.

COSMO OIL COMPANY,
Box 267, Hanford, Cal. J. F. Brown, President. F. B. Cunningham, Secretary. April 29, 1909. $100,000.

***COSMOPOLITAN OIL COMPANY,**
510 Douglas Bldg., Los Angeles, Cal. G. L. Holton, President. Robt. G. Holton, Secretary. May 1, 1912. $400,000. Ventura County.

CRAFTON OIL COMPANY,
Mentone, Cal. J. R. Baird, Jr., President. A. R. Schultz, Secretary. February 17, 1911. $25,000.

CREE OIL COMPANY,
617 Merritt Bldg., Los Angeles, Cal. Burton E. Green, President. F. B. Sutton, Secretary. June 1, 1903. $5,000,000, Orig.; $1,000,000, Dec.

***CRESCEUS OIL COMPANY,**
579 H. W. Hellman Bldg., Los Angeles, Cal. P. E. Spellacy, President. M. Sands, Secretary. March 7, 1907. $320,000. Kern County.

CRESCENT PETROLEUM COMPANY,
7 Webb Bldg., Coalinga, Cal. C. A. Hively, President. A. H. Panley, Secretary. February 29, 1916. $50,000.

***CRITES, ARTHUR S. (Trustee),**
Bakersfield, Cal. Fifteen wells, Kern County. (Formerly Linda Vista Oil Company and Piedmont Oil Company.) (Dissolved.)

CROWN OF THE VALLEY OIL COMPANY,
Box 613, Pasadena, Cal. C. W. Rhodes, President. R. D. Badger, Secretary. March 2, 1900. $300,000. Orange County.

CROW OIL COMPANY,
2726 Hillegass Ave., Berkeley, Cal. C. E. Crow, President. R. B. Marshall, Secretary. April 25, 1900. $400,000.

CUBBON OIL COMPANY,
421 N. Main St., Santa Ana, Cal. John Cubbon, President. J. G. Quick, Secretary. September 24, 1900. $200,000.

***DABNEY & COMPANY, JOSEPH B.,**
605 Union Oil Bldg., Los Angeles, Cal. Joseph Dabney, Owner. Seventeen wells, Kern County.

DABNEY OIL COMPANY,
1026 Marsh-Strong Bldg., Los Angeles, Cal. John R. Wilson, President. John S. Mitchell, Secretary. May 31, 1901. $1,000,000. Kern County.

DAVIS-McPHAILL OIL COMPANY,
Care J. E. Davis, Trinity Hotel, Los Angeles, Cal.

DAYTON OIL COMPANY OF OHIO,
371 W. First St., Dayton, Ohio. Geo. M. Smart, President. G. Frank Kuhno, Secretary. October 15, 1908. $200,000. Kern County.

***DEL REY OIL COMPANY,**
Room 6, Union Savings Bank Bldg., Pasadena, Cal. Alex. Miller, President. John C. Dalton, Secretary. December 19, 1900. $1,000,000. Nine wells, Kern County.

DEL SABLE OIL COMPANY,
530 Davis St., San Francisco, Cal. Louis Getz, President. Louis Nathan, Secretary. November 24, 1899. $250,000.

DELANEY OIL COMPANY, H. L.,
Brea, Orange County, Cal., care Jay E. Sexton. January 25, 1918. $100,000,000.

DE LUXE OIL COMPANY,
P. O. Box 867, Fresno, Cal. George Kaehler, President. A. W. Burdick, Secretary. December 2, 1908. $100,000. (Dissolved.)

***DEVILS DEN CONSOLIDATED OIL COMPANY,**
510 Crocker Bldg., San Francisco, Cal. Geo. T. Cameron, President. R. A. Morton, Secretary. February 2, 1900. $103,000. Twelve wells, Kern County.

DEVILS DEN DEVELOPMENT COMPANY,
Care A. H. Murray, Visalia, Cal. May 18, 1900. $125,000.

DIAMOND OIL COMPANY,
201-202 Bradbury Bldg., Los Angeles, Cal. E. R. Kellam, President. E. H. Miller, Secretary. January 17, 1916. $25,000.

DIAMOND TIP OIL COMPANY,
Reedley, Cal. G. A. Gallagher, President. Harry F. Winnes, Secretary. March, 26, 1910. $12,000.

***DIAMOND VALLEY OIL COMPANY,**
626 S. Spring St., Los Angeles, Cal. Chas. M. Hoff, President. Melvin Bartlett, Secretary. February 3, 1911. $1,000,000. One well, Ventura County.

DIRECTORS OIL COMPANY,
401 Union Oil Bldg., Los Angeles, Cal. E. R. Snyder, President. F. C. Lamb, Secretary. March 9, 1899. $12,000.

DIXIE OIL COMPANY,
121 E. Main St., Visalia, Cal. A. Levis, President. Adolph D. Sweet, Secretary. February 3, 1900. $100,000.

***D. J. OIL COMPANY,**
532 Fifteenth St., Oakland, Cal. C. A. Brown, President. E. R. Arner, Secretary. June 13, 1912. $40,000. Three wells, Kern County; four wells, San Luis Obispo County. (Property sold to California Oil Company.)

DOAN, WHITAKER & LAYMANCE,
1432 Broadway, Oakland, Cal.

***DOHENY PACIFIC PETROLEUM COMPANY,**
1011 Security Bldg., Los Angeles., Cal. E. L. Doheny, President. E. L. Doheny, Jr., Secretary. August 15, 1917. $5,000,000. Five wells, Kern County; 14 wells, Ventura County; 27 wells, Santa Barbara County.

***DOMINION OIL COMPANY,**
21-23 Drumm St., San Francisco, Cal. W. J. Moore, President. A. J. Ranken, Secretary. Janury 20, 1910. $250,000. Four wells, Kern County.

DORAN OIL COMPANY, E. A.,
456 S. Spring St., Los Angeles, Cal. E. A. Doran, President. R. Tudor, Secretary. February 12, 1903. $40,000. (Formerly Doran, Brouse & Price.)

***DUDLEY, B. B. & E. R.,**
532 Fifteenth St., Oakland, Cal. Two wells, Kern County.

DUDLEY OIL COMPANY,
261 California St., San Francisco, Cal. John C. Ils, President. William Kahn, Secretary. October 3, 1907. $10,000.

***DUDLEY PETROLEUM COMPANY, B. B. & E. R.,**
532 Fifteenth St., Oakland, Cal. E. R. Dudley, President. E. R. Arner, Secretary. March 11, 1914. $2,000,000. Fifteen wells. (Property sold to the California Oil Company.)

***DUDLEY RANCH & ORCHARDS COMPANY,**
532 Fifteenth St., Oakland, Cal. Two wells, San Luis Obispo County, Cal. (Property sold to the California Oil Company.)

***DUNHAM, A. M.,**
Box 44, Santa Paula, Cal. Three wells, Ventura County.

***DUNLOP OIL COMPANY,**
1012 Hobart Bldg., San Fracisco, Cal. Fred DeAugustine, President. A. B. Cast, Secretary. November 26, 1909. $200,000. Ten wells, Kern County.

EAGLE HILL OIL COMPANY,
532 I. W. Hellman Bldg., Los Angeles, Cal. Chas. Kestner, President. E. V. T. Sens, Secretary. December 29, 1916. $100,000.

EAGLET OIL COMPANY,
255 Holbrook Bldg., San Francisco, Cal. J. A. Weston, President. S. G. O. King, Secretary. February 27, 1901. $300,000, Orig.; $50,000, Dec. Kern County.

EAST OAKLAND OIL COMPANY,
2322 E. Fifteenth St., Oakland, Cal. J. J. Enos, President. H. A. Bill, Secretary. August 28, 1908. $10,000.

EAST PUENTE ANNEX OIL COMPANY,
412 Bumiller Bldg., Los Angeles, Cal. A. L. Ellis, Vice President. July 17, 1916. $100,000.

***EAST PUENTE OIL COMPANY,**
208 Granger Block, San Diego, Cal. Geo. R. Harrison, President. Geo. R. Rogers, Secretary. March 25, 1901. $500,000. Twenty-four wells, Kern County.

EAST SAN EMIDIO OIL LAND COMPANY,
347 Title Insurance Bldg., Los Angeles, Cal. Chas. A. Cole, President. W. S. McGiffert, Secretary. April 20, 1911. $50,000.

EAST WHITTIER OIL COMPANY,
404 H. W. Hellman Bldg., Los Angeles, Cal. W. W. Neuer, President. Robt. N. Bulla, Secretary. May 21, 1900. $250,000.

ECHO BREA OIL COMPANY,
532 I. W. Hellman Bldg., Los Angeles, Cal. A. C. Labrie, President. E. V. T. Sens, Secretary. October 16, 1912. $100,000.

***EDMONDS MIDWAY OIL COMPANY,**
406 Wilcox Bldg., Los Angeles, Cal. A. B. Barret, President. C. P. Campbell, Secretary. May 27, 1910. $1,500,000. Two wells, Kern County.

EIGHT OIL COMPANY, THE,
P. O. Box 00, Bakersfield, Cal. S. P. Wible, President. T. E. Klipstein, Secretary. March 22, 1909. $50,000.

ELAINE OIL COMPANY,
Box 207, Coalinga, Cal. Arthur Webb, President. Clara E. Webb, Secretary. March 7, 1907. $300,000.

***EL CAMINO OIL & DEVELOPMENT COMPANY,**
228 First National Bank Bldg., Oakland, Cal. W. V. Harrington, President. A. W. Beam, Secretary. October 26, 1910. $600,000. Five wells, Kern County.

ELDEE OIL COMPANY,
Room 637, Holbrook Bldg., 58 Sutter St., San Francisco, Cal. Chas. G. Wilcox, President. Louis Nathan, Secretary. September 15, 1908. $500,000.

***EL DORA OIL COMPANY,**
Box 352, Bakersfield, Cal. One well, Kern County.

***EL DORADO OIL COMPANY,**
597 Monadnock Bldg., San Francisco, Cal. W. J. Berry, President. J. R. Murphy, Secretary. March 4, 1889. $100,000. Five wells, Kern County.

ELECTRA OIL COMPANY,
Room 637, Holbrook Bldg., 58 Sutter St., San Francisco, Cal. Chas. G. Wilcox, President. Louis Nathan, Secretary. November 20, 1908. $500,000.

***ELIM OIL COMPANY,**
Union Oil Bldg., Los Angeles, Cal. J. P. Welles, President. L. M. Stewart, Secretary. September 12, 1912. $50,000. Ventura County.

***ELK HORN OIL COMPANY,**
Box 8, Taft, Cal. R. E. Graham, President. G. G. Patton, Secretary. March 13, 1908. $300,000. Three wells, Kern County.

ELK RIDGE OIL COMPANY,
903 Grattan St., Los Angeles, Cal. March 17, 1910. $10,000.

***ELLIOTT OIL COMPANY,**
310 Sansome St., San Francisco, Cal. Virgil F. Shaw, Secretary. One well, Kern County. (Formerly Elliott Lease.)

ELSINORE AND TEMESCAL OIL AND LAND COMPANY,
304 Bryson Bldg., Los Angeles, Cal. Care Ben White. November 10, 1913. $100,000.

***EMPIRE GAS AND FUEL COMPANY,**
410 Brower Bldg., Bakersfield, Cal. R. A. Broomfield, President. E. C. Reed, Secretary. October 9, 1912. $100,000. One well, Kern County.

EMPIRE OIL COMPANY,
1118 Hearst Bldg., San Francisco, Cal. H. A. Whitley, President. B. H. Henderson, Secretary. February 4, 1909. $2,000. (Dissolved.)

***EMPIRE OIL COMPANY,**
637 Consolidated Realty Bldg., Los Angeles, Cal. A. I. Smith, Manager. Five wells, Ventura County. (Copartnership.)

ENCINAL OIL COMPANY,
414 Marsh-Strong Bldg., Los Angeles, Cal. E. S. Shattuck, President. Wm. J. Nimmo, Secretary. May 2, 1907. $1,000,000.

***ENGINEERS OIL COMPANY,**
519-21 Consolidated Realty Bldg., Los Angeles, Cal. F. C. Kingsbury, President. C. M. Dull, Secretary. March 28, 1911. $220,000. Seven wells, Kern County.

***ENOS OIL COMPANY,**
278 Russ Bldg., San Francisco, Cal. Jno. Baker, Jr., President. I. Sutcliffe, Secretary. May 1, 1909. $500,000. Six wells, Kern County.

ENSIGN OIL COMPANY,
284 Perry St., San Francisco, Cal. E. J. Ensign, President. May 13, 1914. $100,000.

ENTERPRISE LAND AND OIL COMPANY,
58 Sutter St., San Francisco, Cal. J. Goldman, Treasurer-Superintendent. November 7, 1899. $200,000.

EQUITABLE PETROLEUM COMPANY,
1029 Title Insurance Bldg., Los Angeles, Cal. James Shultz, President. Donald Baker, Secretary. October 3, 1908. $100,000. Kern County.

***ETHEL D. COMPANY,**
597 Monadnock Bldg., San Francisco, Cal. C. J. Berry, President. D. S. Ewing, Secretary. September 13, 1909. $1,000,000. Twenty-five wells, Kern County.

ETZENHAUSER OIL COMPANY,
300 E. Main St., Visalia, Cal. L. Lucier, President. J. Sub Johnson, Secretary. October 13, 1909. $75,000.

***EUCLID OIL COMPANY,**
619 Union Oil Bldg., Los Angeles, Cal. M. V. McQuigg, President. A. J. Wallace, Secretary. August 8, 1900. $350,000. Seven wells, Kern County.

***EUREKA CRUDE OIL COMPANY,**
1037 N. Alameda St., Los Angeles, Cal. E. A. Clampitt, President. Henry A. Greene, Secretary. December 26, 1916. $10,000. Two wells, Los Angeles County.

EXPLORATION OIL COMPANY,
201 Sansome St., San Francisco, Cal. Dorsey Ash, President. Walter Loewy, Secretary. March 25, 1909. $200,000, Orig.; $400,000, Inc.

EXTENSION OIL COMPANY,
418 Chamber of Commerce Bldg., Los Angeles, Cal. Julius Fried, President. W. W. Worthing, Secretary. April 13, 1910. $1,000,000. Kern County.

***FAIRBANKS OIL COMPANY,**
2108 Shattuck Ave., Berkeley, Cal. James R. Little, President. Robt. H. Whetmore, Secretary. December 9, 1907. $25,000, Orig.; $50,000, Inc. Twelve wells, Kern County.

FAIRFIELD PETROLEUM COMPANY,
1015 Security Bldg., Los Angeles, Cal. E. L. Doheny, Jr., President. O. D. Bennett, Secretary. April 10, 1916. $10,000.

FAITHFUL OIL COMPANY,
1416 Nineteenth St., Bakersfield, Cal. Chas. E. Lee, Vice President. A. Weill, Secretary. May 20, 1909. $25,000.

FAR WEST COMPANY,
1114 Union Oil Bldg., Los Angeles, Cal. D. T. Perkins, President. W. L. Stewart, Secretary. June 1, 1891. $50,000. (Formerly Far West Oil Company.)

FEDERAL OIL SYNDICATE, THE,
Care C. W. Morris, 506 Chronicle Bldg., San Francisco, Cal. June 1, 1918. $1,000,000.

***FETHER, F. A.,**
Box 125, R. F. D. No. 5, Bakersfield, Cal. Nine wells, Kern County.

***FIVE STAR OIL COMPANY, INC.,**
518 Investment Bldg., Los Angeles, Cal. December 17, 1909. $100,000. (See Cheney Stimson Oil Company.)

FIVE THIRTY-SIX OIL COMPANY,
1047 Monadnock Bldg., San Francisco, Cal. Chester L. Hovey, President. A. E. Bolton, Secretary. June 6, 1907. $100,000. Kern County.

F. M. J. OIL COMPANY,
Box 115, Bakersfield, Cal. J. W. Briscoe, President. J. A. Hughes, Secretary. April 27, 1911. $25,000.

FORT WAYNE CALIFORNIA OIL COMPANY,
510 S. Los Robles Ave., Pasadena, Cal. W. J. Randall, President. Chas. Pfeiffer, Secretary. September 30, 1908. $300,000. Kern County.

***4 OIL COMPANY,**
507 Foxcroft Bldg., San Francisco, Cal. Wm. E. Miles, President. A. J. Weston, Secretary. April 19, 1900. $30,000. Twelve wells, Kern County.

***FOX & GARRETT OIL COMPANY,**
R. F. D. No. 5, Bakersfield, Cal. G. S. Butler, President. R. L. Burdic, Secretary. January 3, 1910. $150,000. Two wells, Kern County.

FOX OIL COMPANY,
H St. and Ocean Ave., Lompoc, Cal. A. Lehmann, President. E. L. Walley, Secretary. November 12, 1909. $440,000. Kern County.

FRESNO MIDWAY LAND AND OIL COMPANY,
County Auditor's Office, Fresno, Cal. Care of S. L. Hogue, Secretary. L. Samuels, President. February 17, 1908. $25,000.

***FULLERTON GREAT WEST OIL COMPANY,**
213 Owl Drug Bldg., San Diego, Cal. A. J. Bradley, President. W. E. Hinkle, Secretary. March 6, 1914. $500,000. Two wells, Orange County.

***FULLERTON OIL COMPANY,**
Box 34, Fullerton, Cal. W. L. Valentine, President. H. M. Marple, Secretary. February 26, 1907. $600,000. Two wells, Los Angeles County; 19 wells, Orange County.

FULLERTON OIL COMPANY (LOS ANGELES),
1124 Merchants National Bank Bldg., Los Angeles. W. L. Valentine, President. H. M. Marple, Secretary. May 8, 1899. $25,000.

FULTON FUEL AND ROAD OIL COMPANY,
Care A. J. Coogan, 904 Merchants Exchange Bldg., San Francisco, Cal. John B. Wandell, President. Herbert N. Leach, Secretary. January 17, 1912. $400,000. (Operated by Melita Oil Company.)

FUTURE SUCCESS OIL COMPANY,
Coalinga, Cal. R. Baker, President. A. A. Baker, Secretary. May 3, 1913. $100,000.

GADDIE OIL DEVELOPMENT COMPANY,
Care G. E. Delevan, Jr., 521 Washington Bldg., Los Angeles, Cal. December 11, 1918. $25,000.

***GARBUTT OIL COMPANY,**
914 Merchants National Bank Bldg., Los Angeles, Cal. Frank A. Garbutt, President. Moye W. Stephens, Secretary. November 1, 1907. $500,000. Two wells, Los Angeles, Cal.

GARNER MADISON OIL COMPANY,
1025 Citizens National Bank Bldg., Los Angeles, Cal. Care Ben. S. Hunter, Secretary. A. J. Garner, President. January 11, 1918. $75,000.

GATO RIDGE OIL COMPANY,
433 California St., San Francisco, Cal. Chas. W. Gardner, President. A. E. Boynton, Secretary. June 18, 1910. $1,000,000.

GENERAL PETROLEUM COMPANY,
1003 Higgins Bldg., Los Angeles, Cal. John Barneson, President. C. R. Stevens, Secretary. March 30, 1910. $50,000,000.

***GENERAL PETROLEUM CORPORATION,**
1003 Higgins Bldg., Los Angeles, Cal. John Barneson, President. C. R. Stevens, Secretary. May 25, 1916. $16,702,400. Sixteen wells, Fresno County; 308 wells, Kern County; 37 wells, Orange County.

***A. F. GILMORE COMPANY,**
700 Van Nuys Bldg., Los Angeles, Cal. E. B. Gilmore, Manager and Secretary. February 3, 1915. $50,000. Eighteen wells, Los Angeles County.

GILMORE PETROLEUM COMPANY,
700 Van Nuys Bldg., Los Angeles, Cal. June 15, 1918. $25,000.

***GILROY OIL COMPANY,**
522 Security Bldg., Los Angeles, Cal. S. C. Graham, President. S. E. Brobst, Secretary. Eight wells, Santa Cruz County. (Dissolved.)

GLACIER PETROLEUM COMPANY,
501 Investment Bldg., Los Angeles, Cal. Claud B. Andrews, President. Lester M. Gray, Secretary. June 28, 1917. $9,600.

GLOBE OIL COMPANY,
619 Union Oil Bldg., Los Angeles, Cal. M. V. McQuigg, President. A. J. Wallace, Secretary. April 11, 1906. $600,000. Kern County.

GOLDEN STATE OIL COMPANY,
2334 E. Twenty-seventh St., Los Angeles, Cal. S. A. Thompson, President. J. O. Haley, Secretary. December 16, 1915. $50,000.

GOLD SEAL PETROLEUM COMPANY,
1005 Haas Bldg., Los Angeles, Cal. John Rome, President. O. Park Smith, Secretary. January 19, 1915. $450,000.

GOOD HOPE WELLS,
814 Merchants National Bank Bldg., Los Angeles, Cal.

***GOOD LUCK OIL COMPANY,**
948 Market St., San Francisco, Cal. James Madison, President. Albert Albrecht, Secretary. January 17, 1905. $100,000. Five wells, Fresno County.

***GOOD ROADS OIL COMPANY,**
208 Brower Bldg., Bakersfield, Cal. W. H. Hill, President. C. A. Barlow, Secretary. January 5, 1914. $50,000. Eight wells, Kern County.

GRADOR OIL COMPANY,
12 South Fair Oaks Ave., Pasadena, Cal. S. C. Graham, President. Arthur N. Gage, Secretary. August 16, 1908. $250,000.

GRAHAM-LOFTUS OIL COMPANY,
Santa Paula, Cal. Wm. Loftus, President. Allan C. McKevitt, Secretary. December 19, 1898. $40,000, Orig.; $1,000,000, Inc. Orange County.

***J. E. GRAY ESTATE,**
Box 263, Bakersfield, Cal. Twenty-eight wells, Kern County.

***J. E. GRAY OIL COMPANY,**
P. O. Box 263, Bakersfield, Cal. S. A. Gray, President. G. W. Gray, Secretary. January 13, 1909. $100,000. Twenty-six wells, Kern County.

GREAT REPUBLIC OIL AND PAINT COMPANY,
619 Brockman Bldg., Los Angeles, Cal. M. F. Tufts, Secretary. January 21, 1915. $250,000. (Revived by Controller May 9, 1917.)

***GUARDIAN OIL COMPANY,**
343 Sansome St., San Francisco, Cal. H. H. Beers, President. R. A. Lewin, Secretary. March 20, 1915. $500,000. Twelve wells, Fresno County.

GUTHREY OIL COMPANY,
1001 Insurance Exchange, San Francisco, Cal. G. W. McNear, Jr., President. J. P. Rothwell, Secretary. January 5, 1906. $150,000.

***HALE-McLEOD OIL COMPANY,**
518 Investment Bldg., Los Angeles, Cal. Nathan W. Hale, President. F. V. Gordon, Secretary. September 29, 1909. Fifteen wells, Kern County.

HALE SYNDICATE,
Troy Owens, Owner. Fellows, Cal. (Wildcat well near McFarland.)

HAMILTON OIL AND GAS COMPANY OF LOS ANGELES,
El Centro, Cal. December 28, 1908. $100,000.

HANFORD DEVIL'S DEN OIL COMPANY,
Care Hanford Water Co., Hanford, Cal. May 1, 1917. $75,000.

***HANFORD-SANGER OIL COMPANY,**
514 I. W. Hellman Bldg., Los Angeles, Cal. F. R. Dunlap, President. H. E. Woods, Secretary. January 31, 1901. $300,000. Four wells, Kern County. (Dissolved.)

HARBOR CRUDE OIL COMPANY,
911 Investment Bldg., Los Angeles, Cal. W. F. Young, President. C. W. DeFreest, Secretary. July 3, 1913. $1,000,000.

HARLIND OIL COMPANY,
Room 1402 Humboldt Bank Bldg., San Francisco, Cal. Chas. M. Lindsay, President. S. N. Norton, Secretary. January 27, 1910. $250,000. Kern County.

HARRIS & CATES (See C. B. Cates Co.),
701 College St., Los Angeles, Cal. (Operating Strong Oil Lease and Arizona Petroleum Lease June to September, 1918.)

***HARRIS AND STEVENS CORPORATION,**
926 Black Bldg., Los Angeles, Cal. C. C. Harris, President. C. P. E. Menzies, Secretary. March 19, 1914. $75,000. Fourteen wells, Kern County.

***C. C. HARRIS OIL COMPANY,**
701 College St., Los Angeles, Cal. Mary B. Cates, President. E. R. Snyder, Secretary. February 10, 1909. $500,000. One hundred and thirty-five wells, Los Angeles City Field.

HART PAYNE COMPANY,
Maricopa, Cal.

HARTER OIL COMPANY,
322 Stimson Bldg., Third and Spring Sts., Los Angeles, Cal. Pavan F. Rice, President. E. Roberts, Secretary. September 22, 1900. $250,000.

HAUHUTH OIL COMPANY,
Vallejo, Cal. Wm. Hauhuth, President. Minnie McPherson, Secretary. November 17, 1916. $50,000.

HAVILAND CRUDE OIL COMPANY,
416 Pacific Electric Bldg., Los Angeles, Cal. Care S. J. White. March 11, 1908. $25,000.

HAWAIIAN OIL COMPANY,
120 Market St., San Francisco, Cal. W. P. Roth, Secretary. June 28, 1909. $250,000. Kern County.

HAYES, H. L.,
Ventura, Cal.

HAZELTON CRUDE OIL COMPANY,
Bakersfield, Cal. J. W. Kelly, President. Ida M. Kelly, Secretary. November 23, 1908. $25,000.

HEARD & PAINTER COMPANY,
Taft, Cal. J. W. Heard, President. Emma C. Heard, Secretary.

HENDERSON OIL COMPANY,
922 Kohl Bldg., San Francisco, Cal. Benj. Bangs, President. Thomas C. Berry, Secretary. June 19, 1908. $500,000. Santa Barbara County.

***HENDERSON UNION OIL COMPANY,**
724 S. Main St., Los Angeles, Cal. E. E. Henderson, President. W. F. Wilson, Secretary. March 20, 1911. $100,000. Four wells, Ventura County.

HENRIETTA OIL COMPANY,
824 Mills Bldg., San Francisco, Cal. Oliver Ellsworth, President. M. A. Thomas, Secretary. October 2, 1900. $200,000. Kern County.

HICKLER OIL COMPANY,
404 S. Raymond Ave., Pasadena, Cal. W. I. Hollingsworth, President. W. H. Smidden, Secretary. February 28, 1901. $200,000.

HIDALGO OIL COMPANY,
307 Insurance Bldg., San Francisco, Cal. F. B. Chapin, President. C. H. Sherman, Secretary. July 19, 1913. $100,000.

HIGHLAND DEVELOPMENT COMPANY,
959 E. Fourth St., Los Angeles, Cal. Jos. F. Stevens, President. L. J. Link, Secretary. December 29, 1915. $10,000.

HIGHLAND OIL COMPANY,
Care L. L. Cory, Fresno, Cal. L. L. Cory, President. E. Owen, Secretary. October 13, 1899. $200,000.

HILLCREST OIL COMPANY,
Howard Canfield Bldg., Santa Barbara, Cal. E. H. Sawyer, President. A. R. Edmondson, Secretary. May 2, 1910. $500,000.

HILL TOP OIL COMPANY,
Box 98, Santa Paula, Cal. I. B. Martin, President. April 21, 1909. $100,000.

***HOME OIL COMPANY,**
P. O. Box 33, Whittier, Cal. L. Butman, President. Alva Starbuck, Secretary. June 19, 1897. $100,000. Thirteen wells, Los Angeles County.

***HOME RANCH PETROLEUM COMPANY,**
923 I. N. Van Nuys Bldg., Los Angeles, Cal. S. A. Guiberson, Jr., President. O. D. Bennett, Secretary. January 12, 1917. $200,000. One well, Ventura County.

***HOMESTEAD DEVELOPMENT COMPANY,**
433 California St., San Francisco, Cal. Chas. W. Gardner, President. A. E. Boynton, Secretary. May 29, 1911. $500,000. Twelve wells, Fresno County.

***HONDO OIL COMPANY,**
617 Merritt Bldg., Los Angeles, Cal. M. L. Whittier, President. H. L. Westbrook, Secretary. July 19, 1916. $100,000. Fifteen wells, Kern County.

***HONOLULU CONSOLIDATED OIL COMPANY,**
120 Market St., San Francisco, Cal. A. C. Diericx, President. W. P. Roth, Secretary. April 19, 1910. $5,000,000. Forty wells, Kern County.

HOPKINS OIL COMPANY,
Santa Maria, Cal. W. A. Haslam, President. Geo. Black, Secretary. July 15, 1907. $75,000.

HUMAUMA OIL COMPANY,
310 Sansome St., San Francisco, Cal. Harry B. Gregg, Vice President. F. Klamp, Secretary. April 16, 1910. $1,000,000.

HURLEY STONE COMPANY,
Consolidated Realty Bldg., Los Angeles, Cal. Kern County. (Co-partnership.)

HUTCHINSON PETROLEUM CORPORATION,
303 International Bank Bldg., Los Angeles, Cal. Care Roger Marchetti. November 13, 1916. $10,000.

IBEX OIL COMPANY,
701 College St., Los Angeles, Cal. Mary B. Cates, President. E. R. Snyder, Secretary. August 25, 1908. $10,000.

***IDA MAY OIL COMPANY,**
Box 58, Maricopa, Cal. Arthur Brand, Secretary. (Woods & Hansen, operators) Kern County.

IDEAL OIL COMPANY,
1028 Chorro St., San Luis Obispo, Cal. Care P. A. H. Arata. July 15, 1907. $50,000.

***ILLINOIS CRUDE OIL COMPANY,**
Box 168, R F D No. 1, Bakersfield, Cal. T. V. Doub, President. C. E. Arnold, Secretary. July 12, 1901. $200,000. Nine wells, Kern County.

IMPERIAL OIL COMPANY,
350 Mills Bldg., San Francisco, Cal. J. J. Mack, President. H. Steinbach, Secretary. August 14, 1899. $100,000.

***INCA OIL COMPANY,**
245 Holbrook Bldg., San Francisco, Cal. Burton E. Green, President. M. B. Downing, Secretary. February 26, 1904. $100,000 Orig.; $750,000 Inc. Thirty-four wells, Fresno County.

***INDIAN AND COLONIAL DEVELOPMENT COMPANY, LIMITED, THE,**
Taft, Cal. Arthur Farish, President. Ernest Jackson, Secretary. December 22, 1911. £1,000. Twenty wells, Kern County.

INDIAN VALLEY OIL COMPANY,
San Miguel, Cal. J. T. Densmore, President. E. Bergemann, Secretary. April 22, 1909. $50,000. (Dissolved.)

***INTERSTATE OIL COMPANY,**
1010 Wright & Callender Bldg., Los Angeles, Cal. D. W. Wickersham, President. Floyd G. White, Secretary. November 14, 1913. $200,000. Six wells, Kern County.

INVESTMENT DEVELOPMENT COMPANY, THE,
406 Insurance Exchange Bldg., San Francisco, Cal. Samuel Pond, President. Albert Meyer, Secretary. January 3, 1911. $100,000.

INVESTMENT OIL COMPANY,
406 Insurance Exchange Bldg., San Francisco, Cal. S. H. Morsehead, President. Samuel Pond, Secretary. July 20, 1899. $500,000.

INVINCIBLE DEVELOPMENT COMPANY,
Care Fred Seulberger, Secretary. 418 Fourteenth St., Oakland, Cal. Geo. Roeth, President. January 15, 1900. $500,000 Orig.; $50,000 Dec.

IOWA OIL COMPANY,
109 N. Greenleaf, Whittier, Cal. September 7, 1900. $200,000.

JOHN IRWIN OIL COMPANY,
Hueneme, Ventura County, Cal. E. O. Gerberding, Secretary. May 10, 1893. $30,000.

IVERS, J. C.,
Fillmore, Cal. One well, Ventura County.

***J. M. S. OIL COMPANY,**
310 Sansome St., San Francisco, Cal. Virgil F. Shaw, Secretary. Six wells, Kern County.

***JACKSON OIL COMPANY,**
Reward, Kern County, Cal. S. P. Wible, President. D. A. Jackson, Secretary. October 18, 1907. $50,000. Ten wells, Kern County.

JADE OIL COMPANY, THE,
1008 Security Bldg., Los Angeles, Cal. R. B. Williamson, President. Geo. L. Reynolds, Secretary. October 16, 1908. $1,000,000. Kern County. (Property leased to Empire Gas & Fuel Company and J. A. Lydell.)

***JEFFERSON OIL COMPANY,**
Care L. L. Richard, Owner. Coalinga, Cal. Two wells, Fresno County.

JESSE YARNELL COMPANY,
134 S. Bonnie Brae St., Los Angeles, Cal. Susan C. Yarnell, President. Catherine Yarnell, Secretary. April 8, 1907. $40,000.

***JEWETT OIL COMPANY,**
Box 205, Bakersfield, Cal. Philo L. Jewett, President. A. Weill, Secretary. August 25, 1900. $500,000. Ten wells, Kern County.

JOHNSON OIL COMPANY,
P. O. Box 1083, Fresno, Cal. E. Schwarz, President. R. D. Marshall, Secretary. December 4, 1908. $100,000.

JORDAN CRUDE OIL COMPANY,
Box 193, Arcade Station, Los Angeles, Cal. James T. Jordan, President. One well, Los Angeles County. (Wildcat.)

JORDAN OIL COMPANY,
Box 193, Arcade Station, Los Angeles, Cal. James T. Jordan, President. Ralph Martin, Secretary. May 25, 1907. $100,000.

JOSEPHINE OIL COMPANY,
1106 Investment Bldg., Los Angeles, Cal. J. M. Kent, President. E. A. Fano, Secretary. July 24, 1916. $25,000.

JUDSON OIL COMPANY,
305 Hibernian Bldg., Los Angeles, Cal. March 15, 1909. $250,000.

***JUNCTION OIL COMPANY,**
58 Sutter St., San Francisco, Cal. J. Goldman, President. S. G. O. King, Secretary. February 7, 1900. $250,000. Eleven wells, Kern County.

JUNE OIL COMPANY,
428 Exchange Bldg., Los Angeles, Cal. Care A. C. Routhe. March 15, 1918. $300,000.

KAISER OIL COMPANY,
1114 Union Oil Bldg., Los Angeles, Cal. W. W. Orcutt, President. John McPeak, Secretary. March 8, 1909. $100,000. Santa Barbara County. (Dissolved.)

K. AND V. OIL COMPANY,
P. O. Box 482, Visalia, Cal. Susman Mitchell, President. A. Q. Beals, Secretary. March 1, 1909. $100,000.

***KANSAS CRUDE OIL COMPANY,**
Care F. L. Sawyer, Independence, Kansas. One well, Los Angeles County.

KAWEAH OIL DEVELOPMENT COMPANY,
P. O. Box 482, Visalia, Cal. H. A. Scott, President. A. Q. Beals, Secretary. March 22, 1909. $100,000.

KEELER & TAUSSIG,
Citizens National Bank Bldg., Los Angeles, Cal.

KEITH AND MACK OIL COMPANY,
350 Mills Bldg., San Francisco, Cal. A. Mack, President. H. Steinbach, Secretary. December 4, 1907. $20,000.

KEITH OIL AND LAND COMPANY,
350 Mills Bldg., San Francisco, Cal. A. Mack, President. H. Steinbach, Secretary. November 8, 1900. $200,000.

KELLOGG OIL COMPANY,
933 Van Nuys Bldg., Los Angeles, Cal. F. R. Kellogg, President. G. J. Syminton, Secretary. December 9, 1910. $50,000.

KERN CAÑON OIL COMPANY,
P. O. Box 235, Fresno, Cal. S. A. LaRue, President. F. L. Simons, Secretary. March 6, 1900. $75,000. Kern County.

KERN CENTRAL OIL COMPANY,
Room 1012 Mills Bldg., San Francisco, Cal. J. W. McCaughey, Secretary. December 21, 1899. $100,000.

***KERN CROWN OIL COMPANY,**
Box 315, Taft, Cal. Catherine Sutherland, President. Hazel Benson, Secretary. December 20, 1915. $20,000. Three wells, Kern County.

***KERN FOUR OIL COMPANY,**
519-21 Consolidated Realty Bldg., Los Angeles, Cal. F. C. Kingsbury, President. C. M. Dull, Secretary. May 26, 1909. $100,000. Twenty-two wells, Kern County.

KERN PETROLEUM COMPANY,
509 Second St., Eureka, Cal. F. M. Downing, President. J. D. Girard, Secretary. February 17, 1910. $250,000.

KERN PUCHEU OIL COMPANY,
2033 Mariposa St., Fresno, Cal. E. E. Slater, President. John Oed, Secretary. February 27, 1913. $200,000.

KERN RIVER DRILLERS OIL COMPANY,
1106 Investment Bldg., Los Angeles, Cal. J. M. Kent, President. E. T. Grady, Secretary. March 3, 1909. $100,000. Kern County.

***KERN RIVER OIL COMPANY,**
238 Merchants Exchange Bldg., San Francisco, Cal. H. A. Voorman, President. E. C. Landis, Secretary. June 29, 1899. $100,000. Kern County.

***KERN RIVER OILFIELDS OF CALIFORNIA, LIMITED, THE,**
1117 Investment Bldg., Los Angeles, Cal. Wm. Ivey, President. Reginald H. Young, Secretary. July 6, 1910. $2,908,325. Two hundred fifty-six wells, Kern County.

KERN SUNSET OIL COMPANY,
Maricopa Bank Bldg., Maricopa, Cal. E. A. Bear, President. Walter Snook, Secretary. March 27, 1908. $100,000 Orig.; $10,000 Dec.

KINGS RIVER OIL COMPANY,
R. F. D. B, Box 1076, Fresno, Cal. Burton Elwood, President. Mrs. J. C. Marlar, Secretary. June 5, 1899. $100,000.

***KNICKERBOCKER OIL COMPANY,**
60 California St., San Francisco, Cal. J. D. Spreckels, Jr., President. G. B. Waterman, Secretary. March 15, 1911. $400,000. Kern County.

***KNOB HILL OIL COMPANY,**
201 Cory Bldg., Fresno, Cal. James Porteous, President. W. J. Kittrell, Secretary. August 6, 1900. $25,000. Thirty-three wells, Kern County.

KOPJE OIL COMPANY,
Box 1306, Fresno, Cal. Geo. S. Waterman, President. M. M. Dearing, Secretary. January 4, 1901. $100,000.

KRAMER CONSOLIDATED OIL COMPANY,
403 Germain Bldg., 224 S. Spring St., Los Angeles, Cal. J. J. Morris, President. D. F. Wilson, Secretary. November 2, 1900. $150,000 Orig.; $600,000 Inc.

KRAMER MODEL OIL COMPANY,
Room 403 Germain Bldg., 224 S. Spring St., Los Angeles, Cal. Lester S. Moore, President. Chas. T. Merritt, Secretary. April 29, 1910. $21,000.

LA BELLE OIL COMPANY,
714 Central Bldg., Los Angeles, Cal. W. P. Cunningham, President. Stone Hastain, Secretary. March 5, 1909. $100,000.

***LA BLANC OIL COMPANY, THE,**
228 First National Bank Bldg., Oakland, Cal. J. C. Downey, President. W. V. Harrington, Secretary. October 1, 1908. $250,000. Two wells, Kern County.

***LABONGE, R. F.,**
Kentuck Lease, Fillmore, Cal. Three wells, Ventura County.

LACEY OIL COMPANY,
First National Bank, Hanford, Cal. J. E. Hall, President. R. V. Hall, Secretary. November 1, 1909. $500,000.

LA CORONA OIL AND ASPHALT COMPANY,
1809 Chester Ave., Bakersfield, Cal. L. V. Oleese, Presdent. J. B. Hewitt, Secretary. October 8, 1897. $19,000.

LAGUNA OIL COMPANY,
Front and K Sts., Sacramento, Cal. Henry Mitau, President. G. W. Peltier, Secretary. April 19, 1917. $50,000.

LA HABRA OIL COMPANY,
119 E. Colorado St., Pasadena, Cal. L. P. Hansen, President. Leo G. MacLaughlin, Secretary. April 6, 1910. $500,000.

***LAKEPORT PETROLEUM COMPANY,**
Farmers Bank Bldg., Fresno, Cal. W. F. Chandler, President. H. H. Welsh, Secretary. May 20, 1916. $100,000. Three wells, Fresno County.

LAKESHORE OIL COMPANY,
510 Crocker Bldg., San Francisco, Cal. Geo. T. Cameron, President. R. A. Morton, Secretary. October 22, 1909. $750,000. (Operated by Universal Oil Company.)

LAKEVIEW ANNEX OIL COMPANY,
Room 316, 430 S. Broadway, Los Angeles, Cal. November 21, 1910. $2,000,000.

***LAKEVIEW NO. 2 OIL COMPANY,**
1011 Wright & Callendar Bldg., Los Angeles, Cal. C. H. White, President. F. G. White, Secretary. May 11, 1910. $1,000,000. Six wells, Kern County.

***LAKEVIEW OIL COMPANY,**
1114 Union Oil Bldg., Los Angeles, Cal. W. L. Stewart, President. John McPeak, Secretary. December 9, 1908. $2,500,000. Five wells, Kern County.

LENNON OIL COMPANY,
120 W. D St., Coalinga, Cal. Care H. R. Crozier. January 15, 1907. $75,000.

LE ROY OIL COMPANY,
241 Sansome St., San Francisco, Cal. M. C. Hunter, President. Phil Heuer, Secretary. February 3, 1913. $100,000.

LIBERTY BELL OIL COMPANY,
502 First National Bank Bldg., Oakland, Cal. Care M. E. Bruner. May 5, 1916. $1,000,000.

LIBERTY OIL AND REFINING COMPANY,
812 Syndicate Bldg., Oakland, Cal. Care Peck, Bunker & Cole. October 30, 1917. $200,000.

LIBERTY PETROLEUM COMPANY,
118 West Center St., Anaheim, Cal. Lee C. Deming, President. C. C. Randall, Secretary. June 19, 1918. $100,000.

LIGHT OIL EXTENSION COMPANY,
Room 637, 58 Sutter St., San Francisco, Cal. Louis Nathan, President. Chas. G. Wilcox, Secretary. November 25, 1908. $500,000.

***LILLIS, J. E.,**
Summerland, Cal. Ten wells, Santa Barbara County.

LINCOLN OIL COMPANY,
708 Hibernian Bldg., Los Angeles, Cal. Care John S. Steely. October 15, 1917. $10,000.

LINDA VISTA OIL COMPANY,
1206 Broadway, Oakland, Cal. E. A. Heron, President. A. H. Breed, Secretary. November 23, 1900. $250,000. (Dissolved.)

LINDSAY INCORPORATED OIL COMPANY,
Lindsay, Cal. L. A. Sturgeon, President. L. G. Stallings, Secretary. November 11, 1909. $200,000.

LION OIL COMPANY,
474 N. First St., San Jose, Cal. S. W. Waterhouse, President. Annie C. Waterhouse, Secretary. September 2, 1914. $25,000. (Dissolved.)

***LISCOMB & BRIDGE,**
1183 Garfield Ave., Pasadena, Cal. A. H. Liscomb, Managing Partner. Six wells, Kern County.

LITTLE JACK OIL COMPANY,
305 E Sixth St., Hanford, Cal. Care Thos. Downing, President. May 16, 1912. $100,000.

LITTLE SESPE CONSOLIDATED OIL COMPANY,
2388 W. 21st St., Los Angeles, Cal. O. W. Roberts, President. W. P. Martin, Secretary. August 1, 1905. $30,000. Ventura County.

LOMA OIL COMPANY,
648 S. Olive St., Los Angeles, Cal. Frank A. Garbutt, President. Samuel C. Hall, Secretary. October 14, 1895. $50,000.

LOMPOC MONARCH OIL COMPANY,
349 Rialto Bldg., San Francisco, Cal. Howard A. Broughton, President. L. Huseman, Secretary. May 25, 1914. $1,000,000.

LOMPOC OIL DEVELOPING COMPANY,
Lompoc, Cal. Care F. J. Miller, Secretary. W. J. Packard, President. September 4, 1900. $300,000.

LOPEZ CANYON OIL COMPANY,
74 New Montgomery St., San Francisco, Cal. Care A. L. Darrow. February 14, 1907. $500,000.

LOS ALAMOS PETROLEUM COMPANY,
1004 Title Insurance Bldg., Los Angeles, Cal. Oliver C. Edwards, President. Jay Spence, Secretary. October 2, 1907. $500,000.

LOS ANGELES COALINGA OIL SYNDICATE,
307 Severance Bldg., Los Angeles, Cal. W. C. Elderton, President. W. W. Pedder, Secretary. July 8, 1909. $60,000. (Dissolved.)

***LOS ANGELES KERN OIL COMPANY,**
1007 Haas Bldg., Los Angeles, Cal. M. W. Parker, President. H. W. Pettebone, Secretary. December 10, 1908. $400,000. Three wells, Kern County. (Dissolved.)

LOS ANGELES OIL COMPANY,
1114 Union Oil Bldg., Los Angeles, Cal. W. L. Stewart, President. John McPeak, Secretary. October 23, 1874. $1,000,000, Orig.; $50,000 Dec.

LOS FLORES LAND AND OIL COMPANY,
510 Crocker Bldg., San Francisco, Cal. R. N. Bishop, President. R. A. Morton, Secretary. July 25, 1902. $1,000,000. Santa Barbara County.

LOST HILLS INVESTMENT COMPANY,
58 Sutter St., San Francisco, Cal. O. Scribner, President. M. B. Downing, Secretary. December 20, 1911. $24,000.

LOST HILLS MINING COMPANY,
510 Crocker Bldg., San Francisco, Cal. Geo. T. Cameron, President. R. A. Morton, Secretary. March 12, 1909. $36,800. Orig.: $100,000 Inc. (Operated by Universal Oil Company.)

***LOWELL OIL COMPANY,**
9 Main St., San Francisco, Cal. A. N. Baldwin, Secretary. Ten wells, Kern County.

***LUCILE OIL COMPANY,**
P. O. Box 37, Coalinga, Cal. Ida R. Robertson, President. R. W. Dallas, Secretary. February 23, 1905. $50,000. Fresno County.

LUCKY BOY OIL COMPANY,
632 Wesley Roberts Bldg., Los Angeles, Cal. Warren Gillilen, President. Wm. K. Weaver, Secretary. September 14, 1909. $750,000. Kern County.

***MAINE STATE OIL COMPANY,**
Insurance Exchange, San Francisco, Cal. F. W. McNear, President. J. P. Rothwell, Secretary. January 16, 1900. $250,000. Six wells, Fresno County.

MAJESTIC OIL COMPANY,
Santa Maria, Cal. F. C. Twitchell, President. Geo. P. Merritt, Secretary. June 15, 1907. $500,000.

***M. & T. OIL COMPANY,**
703 Syndicate Bldg., Oakland, Cal. E. N. Moor, President. Stewart S. Hawley, Secretary. January 15, 1910. $300,000. Two wells, Kern County.

MAMMOTH OIL COMPANY,
597 Monadnock Bldg., San Francisco, Cal. J. R. Murphy, Assistant Secretary. Kern County. (Dissolved.)

***MANLEY & McGINN,**
597 Monadnock Bldg., San Francisco, Cal. J. R. Murphy, Agent. Sixteen wells, Kern County.

MARATHON OIL COMPANY,
First National Bank Bldg., Dinuba, Cal. E. C. Snell, President. Karl R. Dennis, Secretary. May 19, 1909. $75,000.

MARIAN OIL COMPANY OF COALINGA,
Coalinga, Cal. O. D. Loftus, President. J. A. Fluetsch, Secretary. March 25, 1909. $150,000. Fresno County.

MARICOPA INVESTMENT COMPANY,
2223 Tenth Street, Bakersfield, Cal. W. J. Schultz, President. E. L. Schultz, Secretary. May 25, 1910. $25,000. Kern County.

***MARICOPA NATIONAL PETROLEUM COMPANY,**
P. O. Box 411, Fresno, Cal. A. S. Cleary, President. E. V. Williams, Secretary. February 16, 1910. $400,000. Two wells, Kern County.

MARICOPA OIL COMPANY OF CALIFORNIA,
61 N. Main St., Napa, Cal. Care Theo. W. Bernhard, Secretary. W. J. Schultz, President. December 11, 1915. $100,000.

MARICOPA QUEEN OIL COMPANY,
216 Marine Bank Bldg., Long Beach, Cal. A. H. Smith, President. Otis Frey, Secretary. October 8, 1910. $1,000,000.

***MARICOPA STAR OIL COMPANY,**
1004 Security Bldg., Los Angeles, Cal. Thos. A. O'Donnell, President. Ellis T. Yarnell, Secretary. October 29, 1913. $100,000. Three wells, Kern County.

***MARICOPA 36 OIL COMPANY,**
Alaska Commercial Bldg., San Francisco, Cal. A. H. Greenewald, President. Wm. Herlitz, Secretary. February 3, 1910. $250,000. Two wells, Kern County.

***MARINA OIL COMPANY,**
324 Sansome St., San Francisco, Cal. John Barneson, President. J. Leslie Barneson, Secretary. November 25, 1916. $750,000. Twenty-four wells, Kern County.

MARION OIL COMPANY,
706 Flatiron Bldg., San Francisco, Cal. Henry Ach, President. A. A. Power, Secretary. November 5, 1908. $600,000. Kern County.

***MASCOT OIL COMPANY,**
489 I. W. Hellman Bldg., Los Angeles, Cal. T. Spellacy, President. P. E. Spellacy, Secretary. November 11, 1901. $500,000. Forty-four wells, Kern County.

MAUSARD, R., and JAMESON, A. L.,
435 Security Bldg., Los Angeles, Cal. One well, Ventura County. (Wildcat.)

MAXWELL OIL COMPANY,
716 Sheldon Bldg., San Francisco, Cal. A. F. L. Bell, President. Albert W. Potts, Secretary. January 27, 1910. $250,000.

***MAY, MARY AGNES, ET AL.,**
Drawer No. 5, Bakersfield, Cal. Seven wells, Kern County.

***MAY OIL COMPANY,**
607 S. Hill St., R. 421, Los Angeles, Cal. Wm. Mead, President. L. Schenck, Secretary. May 7, 1902. $200,000. Nine wells, Kern County.

MAYS CONSOLIDATED OIL COMPANY,
311 California St., San Francisco, Cal. F. B. Chapin, President. F. Johnson, Secretary. May 19, 1911. $100,000.

***McCUTCHEN BROS.,**
Maricopa, Cal. Geo. W. McCutchen, Secretary. Seven wells, Kern County.

McGINLEY OIL COMPANY,
414 Merritt Bldg., Los Angeles, Cal.

McKITTRICK EXTENSION OIL COMPANY,
1527 Nineteenth St., Bakersfield, Cal. S. P. Wible, President. C. Brower, Secretary. November 1, 1900. $350,000.

McKITTRICK FRONT OIL COMPANY,
1112 Merchants National Bank Bldg., San Francisco, Cal. W. F. Williamson, President. A. G. Dibblee, Secretary. April 29, 1910. $50,000.

MARICOPA NORTHERN OIL COMPANY,
347 Title Insurance Bldg., Los Angeles, Cal. C. J. Heyler, President. M. M. Miles, Secretary. August 21, 1914. $1,000,000.

***McKITTRICK OIL COMPANY,**
Brower Bldg., Bakersfield, Cal. H. A. Jastro, President. C. Brower, Secretary. November 18, 1899. $500,000. Two wells, Kern County.

McKITTRICK PROSPERITY PETROLEUM COMPANY,
227 Sacramento St., Nevada City, Cal. A. R. Lord, President. C. W. Chapman, Secretary. November 20, 1900. $500,000.

***McQUIGG BROS.,**
Union Oil Bldg., Los Angeles, Cal. H. M. McQuigg, Manager. Kern County.

***MECCA OIL COMPANY,**
Bakersfield, Cal. D. H. McConnell, President. A. D. Henderson, Secretary. April 23, 1901. $450,000. Fourteen wells, Kern County.

***MECCA OIL COMPANY NO. 2,**
Bakersfield, Cal. D. H. McConnell, President. A. D. Henderson, Secretary. July 9, 1912. $100,000. Seven wells, Kern County.

***MELITA OIL COMPANY,**
607 First National Bank Bldg., San Francisco, Cal. Thos. G. Hutt, President. A. Whearty, Secretary. December 23, 1915. $20,000. Fifteen wells, Kern County.

MELTON OIL COMPANY,
511 American Bank Bldg., Los Angeles, Cal. Care Paul Nourse. March 12, 1917. $50,000.

***MERCANTILE CRUDE OIL COMPANY,**
Grant Bldg., San Francisco, Cal. Peter Caubu, President. P. B. Stumpf, Secretary. December 18, 1900. $200,000. Five wells, Fresno County.

MERCED PARAFFINE OIL COMPANY,
Los Banos, Cal. A. H. Salau, President. S. P. Geehrn, Secretary. June 9, 1914. $1,000,000.

MERICOS OIL COMPANY,
524 Auditorium Bldg., Los Angeles, Cal. Burton E. Green, President. Calvin C. Green, Secretary. November 7, 1901. $100,000, Orig.; $10,000 Dec.

MEXICAN ASSOCIATED OIL COMPANY,
232 S. Broadway, Los Angeles, Cal. Care Chas. L. Wilde, Secretary. April 1, 1910. $1,500,000.

MEXICAN PETROLEUM COMPANY,
1015 Security Bldg., Los Angeles, Cal. E. L. Doheny, President. O. D. Bennett, Secretary. December 20, 1900. $10,000,000.

MIDAS OIL COMPANY,
409 Hosfield Bldg., Los Angeles, Cal. H. P. Cortelyou, President. John W. Cooke, Secretary. June 20, 1917. $20,000.

MIDGET OIL COMPANY,
60 California St., San Francisco, Cal. J. D. Spreckels, Jr., President. W. H. Hannam, Secretary. April 11, 1910. $25,000.

***MIDLAND OIL COMPANY, THE,**
1034 Security Bldg., Los Angeles, Cal. I. W. Fuqua, Vice President. Norman Bridge, Secretary. November 20, 1908. $100,000. Six wells, Kern County.

***MIDLANDS OILFIELDS COMPANY, LTD.,**
1034 Security Bldg., Los Angeles, Cal. T. A. O'Donnell, President. Norman Bridge, Secretary. April 15, 1910 $1,000,000. Four wells, Kern County.

MID STATE OIL COMPANY,
Bank of Italy Bldg., Santa Rosa, Cal. Care Ross Campbell. February 15, 1918. $10,000.

MIDWAY BASIN OIL COMPANY,
230 American Bank Bldg., Monrovia, Cal. Augustus G. Stearns, President. Herbert J. Evans, Secretary. April 13, 1910. $500,000.

MIDWAY COLUMBIAN OIL COMPANY, LTD.,
744 Hastings St., W., Vancouver, B. C. Wm. A. Bauer, President. J. W. Bauer, Secretary. June 18, 1912. $500,000. Kern County.

***MIDWAY CONSOLIDATED LIMITED,**
P. O. Box 79, Fellows, Cal. Capt. A. C. Adams, President. C. F. Burton, Secretary. October 21, 1913. £100,000. Two wells, Kern County.

***MIDWAY FIELDS OIL COMPANY,**
Garland Bldg., 740 S. Broadway, Los Angeles, Cal. C. E. Groat, President. Ben R. Meyer, Secretary. August 8, 1910. $1,000,000. One well, Kern County.

***MIDWAY FIVE OIL COMPANY,**
622 I. W. Hellman Bldg., Los Angeles, Cal. Edwin L. Martin, President. F. L. Bortalls, Secretary. March 22, 1910. $1,000,000. Five wells, Kern County.

***MIDWAY GAS COMPANY,**
809 Garland Bldg., Los Angeles, Cal. F. Reis, Jr., President. W. S. Pardy, Secretary. November 18, 1911. $3,500,000. Four wells, Kern County.

***MIDWAY NORTHERN OIL COMPANY,**
347 Title Insurance Bldg., Los Angeles, Cal. W. S. McGiffert, President. M. M. Miles, Secretary. October 15, 1910. $1,000,000. Three wells, Kern County.

***MIDWAY OIL COMPANY,**
Room 603, 310 Sansome St., San Francisco, Cal. James Ogden, President. A Heyman, Secretary. May 4, 1901. $1,000,000. Twenty-four wells, Kern County.

MIDWAY OIL COMPANY,
302 Concord Bldg., Portland, Ore. Chas. E. Ladd, President. A. E. Davis, Secretary. May 4, 1901. $1,000,000.

***MIDWAY PACIFIC OIL COMPANY, THE,**
1058 S. Flower St., Los Angeles, Cal. Philip L. Wilson, President. P. F. Schumacher, Secretary. April 18, 1910. $2,000,000. Five wells, Kern County.

***MIDWAY PEERLESS OIL COMPANY,**
617 Merritt Bldg., Los Angeles, Cal. M. H. Whittier, President. H. L. Westbrook, Secretary. February 28, 1911. $600,000. Fourteen wells, Kern County.

***MIDWAY PREMIER OIL COMPANY,**
1103 Federal Realty Bldg., Oakland, Cal. A. J. Snyder, President. L. E. Bower, Secretary. March 18, 1910. $1,000,000. Nine wells, Kern County.

***MIDWAY ROYAL PETROLEUM COMPANY,**
648 S. Olive St., Los Angeles, Cal. Frank A. Garbutt, President. S. C. Hall, Secretary. October 13, 1910. $1,000,000. Eleven wells, Kern County.

M. J. AND M. & M. CONSOLIDATED,
2779 Poplar St., Oakland, Cal. Bernard Ransome, President. Emery W. Elliot, Secretary. August 22, 1910. $2,000,000. Kern County. (Property leased to Standard Oil Company.)

***MILES, WILLIAM E.,**
68 Post St., San Francisco, Cal. Five wells, Kern County.

***MILLIE FRANCIS OIL COMPANY,**
Box 8, Taft, Cal. T. O. May, Superintendent. Seven wells, Kern County.

MINORU OIL COMPANY,
310 Sansome St., San Francisco, Cal. John Barneson, President. W. J. Dinsmore, Secretary. June 2, 1909. $500,000.

***MIOCENE OIL COMPANY,**
Maricopa, Cal. P. Welch, President. R. G. Lauer, Secretary. July 5, 1912. $20,000. Two wells, Kern County.

M. K. AND T. OIL COMPANY,
201 First Savings Bank Bldg., Oakland, Cal. George D. Metcalf, President. John B. Metcalf, Secretary. January 15, 1900. $300,000. Fresno County

***MOCAL OIL COMPANY,**
Shale, Kern County, Cal. Chas. Rittersbacher, President. Elmer Rittersbacher, Secretary. June 3, 1911. $300,000. Five wells, Kern County.

***MODELO OIL COMPANY,**
300 Crocker Bldg., San Francisco, Cal. A. F. Morrison, President. W. R. Berry, Secretary. April 26, 1898. $250,000. Nine wells, Ventura County.

MOGUL OIL COMPANY,
Visalia, Cal. Care L. C. Branch. I. Shiffert, President. L. C. Branch, Secretary. October 6, 1909. $100,000.

MONARCH OIL COMPANY,
1809 Chester Ave., Bakersfield, Cal. L. V. Olcese, President. J. B. Hewitt, Secretary. February 3, 1900. $100,000.

MONTANA FRESNO OIL COMPANY,
1245 I St., Fresno, Cal. W. M. Wyatt, President. Wm. F. Dunn, Secretary. January 14, 1900. $14,000.

***MONTANA-WYOMING OIL COMPANY,**
426 McIntyre Bldg., Salt Lake City, Utah. Wm. Spry, President. A. B. Carstensen, Secretary. October 1, 1917. $250,000. One well, Kern County.

MONTEBELLO CRUDE OIL COMPANY,
Care Goodwin & Morgrage, 1117 Title Insurance Bldg., Los Angeles. August 7, 1918. $500,000.

MONTEBELLO NUMBER ONE OIL COMPANY,
Room 602, 256 S. Spring St., Los Angeles, Cal. Care Geo. A. Boden. January 4, 1918. $200,000.

MONTEBELLO NATIONAL OIL COMPANY,
1124 Title Insurance Bldg., Los Angeles, Cal. August 30, 1918. $100,000.

MONTEBELLO NATIONAL OIL COMPANY,
Care Sol. A. Rehart, 1103 Hollingsworth Bldg., Los Angeles, Cal. July 22, 1918. $1,500,000. (Arizona Corporation.)

***MONTEBELLO OIL COMPANY,**
433 California St., San Francisco, Cal. Chas. W. Gardner, President. A. E. Boynton, Secretary. May 5, 1909. $1,000,000. Eighty-three wells, Ventura County.

***MONTGOMERY, BUELAH J.,**
R. F. D. No. 1, Box 39, Bakersfield, Cal. Kern County. (Property operated by Davis-McPhail Oil Company.)

MOUNT DIABLO OIL, MINING AND DEVELOPMENT COMPANY,
517 Central Bldg., Los Angeles, Cal. Jas. Cullingham, President. N. K. Potter, Secretary. February 23, 1900. $500,000. Kern County.

M. P. OIL COMPANY,
Care Security Trust Company, Bakersfield, Cal. Arthur S. Crites, President. M. P. Flickinger, Secretary. May 8, 1909. $21,000.

MUNROE OIL COMPANY,
521 W. P. Story Bldg., Los Angeles, Cal. Geo. W. Walker, President, F. V. Gordon, Secretary. April 25, 1912. $50,000.

MURIEL OIL COMPANY,
310 Sansome St., San Francisco, Cal. John Barneson, President. W. J. Dinsmore, Secretary. April 22, 1909. $250,000.

***MURPHY, W. J.,**
2112 Truxton Ave., Bakersfield, Cal. Two wells, Kern County.

MURPHY OIL COMPANY,
Box "M," Whittier, Cal. William H. Murphy, President. J. T. F. Baeyertz, Secretary. August 18, 1904. $2,000,000. Los Angeles County and Orange County.

***MUSCATINE OIL COMPANY,**
814 Merchants National Bank Bldg., Los Angeles, Cal. Mira Hershey, President. G. C. Macfarland, Secretary. August 3, 1908. $20,000, Orig.; $300,000, Inc. Five wells, Kern County. (Sold to Mira Hershey, who will operate under name of Good Hope Wells.)

***MUTUAL OIL COMPANY,**
1006 California Bldg., Los Angeles, Cal. R. G. Holton, President. Grace L. Stevens, Secretary. May 11, 1907. $400,000. One well, Ventura County.

***MYRICK, RUTH K. (MRS.),**
404-5 International Bank Bldg., Los Angeles, Cal. O. H. Myrick, Agent. Eight wells, Kern County.

***NACIREMA OIL COMPANY,**
410 Brower Bldg., Bakersfield, Cal. Robt. Law, Jr., President. E. C. Reed, Secretary. September 29, 1909. $50,000. Kern County.

NATIONAL OIL COMPANY,
627 E. Third St., Los Angeles, Cal. H. H. Schwarz, President. B. L. Schwarz, Secretary. June 15, 1915. $10,000. (Company advises out of business.)

***NATIONAL PACIFIC OIL COMPANY,**
1011 Higgins Bldg., Los Angeles, Cal. John Barneson, President. D. W. Woods, Secretary. December 6, 1911. $3,500,000. Two wells, Kern County.

NATIONAL PETROLEUM COMPANY,
1003 Higgins Bldg., Los Angeles, Cal. Wm. Walker, President. C. R. Stevens, Secretary. April 24, 1913. $100,000.

NATURAL GAS AND PETROLEUM COMPANY,
532 Fifteenth St., Oakland, Cal. C. A. Brown, President. F. Thomas, Secretary. February 3, 1917. $100,000.

***NETHERLANDS OIL COMPANY,**
1910 Mariposa St., Fresno, Cal. W. B. Holland, President. Ben Epstein, Secretary. March 5, 1909. $200,000. Fresno County.

***NEVADA COUNTY OIL COMPANY,**
820 Union Oil Bldg., Los Angeles, Cal. D. E. Morgan, President. W. B. Robb, Secretary. September 22, 1900. $250,000. Fourteen wells, Kern County.

***NEVADA PETROLEUM COMPANY, THE**
1026 Crocker Bldg., San Francisco, Cal. A. D. Davis, President. G. D. Abbott, Secretary. December 23, 1908. $1,000,000, Orig.; $5,000,000, Inc. Twenty-nine wells, Kern County.

NEW CASTAIC OIL COMPANY,
1525 Brooklyn Ave., Los Angeles, Cal. Geo. D. Alspach, President. Genevieve D. Garner, Secretary. March 18, 1909. $500,000.

***NEW CENTER OIL COMPANY,**
9 Main St., San Francisco, Cal. D. S. Bachman, President. A. N. Baldwin, Secretary. September 25, 1905. $25,000. Five wells, Fresno County.

NEW ENGLAND OIL COMPANY,
119 E. Colorado St., Pasadena, Cal. M. E. Wood, President. MacD. Snowball, Secretary. April 16, 1900. $300,000.

NEW ERA OIL COMPANY,
Southern Title Bldg., San Diego, Cal. Care Sumner & May. September 30, 1916. $100,000.

NEWHALL MOUNTAIN OIL COMPANY,
210 S. Hudson Ave., Pasadena, Cal. L. D. Swartwout, President. S. L. Wallis, Secretary. October 19, 1901. $50,000.

NEW HOPE OIL COMPANY,
722 Mills Bldg., San Francisco, Cal. C. S. Loumeister, Vice President. W. E. Dennison, Secretary. October 3, 1899. $100,000.

NEWLOVE OIL COMPANY,
1114 Union Oil Bldg., Los Angeles, Cal. W. W. Orcutt, President. John McPeak, Secretary. April 30, 1906. $1,500,000. Santa Barbara County.

NEWMAN, MORRIS OIL AND LAND COMPANY,
1 Powell St., San Francisco, Cal. W. W. Kaye, President. Chas. J. Newman, Secretary. January 3, 1912. $500,000.

NEW MEXICO OIL COMPANY,
Ventura, Cal. Gus Mulholland, Manager.

***NEW PENNSYLVANIA PETROLEUM COMPANY,**
105 N. Broadway, Santa Maria, Cal. A. F. Fugler, President. G. M. Scott, Secretary. August 6, 1904. $500,000. Four wells, Santa Barbara County.

***NEW SAN FRANCISCO CRUDE OIL COMPANY,**
904 I St., Fresno, Cal. H. H. Welsh, Vice President. W. J. O'Neill, Secretary. January 17, 1902. $40,000 Orig.; $150,000 Inc. One well, Fresno County.

***NILES LEASE COMPANY,**
1034 Security Bldg., Los Angeles, Cal. W. D. Stewart, Vice President. Norman Bridge, Secretary. February 17, 1908. $1,000,000. Eight wells, Los Angeles County.

***NORTH AMERICAN OIL CONSOLIDATED,**
544 Market St., San Francisco, Cal. Louis Titus, President. C. F. Nance, Secretary. February 3, 1910. $3,000,000. Thirty-one wells, Kern County.

NORTH MIDWAY OIL COMPANY,
Box 598, Care Roy Jones, Santa Monica, Cal. L. W. Andrews, President. Roy Jones, Secretary. November 8, 1909. $200,000.

NORTHERN OIL COMPANY,
9 Main St., San Francisco, Cal. A. N. Baldwin, Secretary.

OAKBURN OIL COMPANY,
1003 Higgins Bldg., Los Angeles, Cal. J. W. Maddrill, President. C. R. Stevens, Secretary. February 18, 1910. $1,000,000.

***OAKLAND MIDWAY OIL COMPANY,**
612 Union Savings Bank Bldg., Oakland, Cal. G. B. M. Gray, President. James P. Taylor, Secretary. June 15, 1910. $500,000. Four wells, Kern County.

OAKLAND OIL COMPANY,
58 Sutter St., San Francisco, Cal. W. T. Sesnon, Vice President. A. J. Samuel, Secretary. September 14, 1899. $20,000.

***OAK RIDGE OIL COMPANY,**
433 California St., San Francisco, Cal. Chas. W. Gardner, President. A. E. Boynton, Secretary. January 6, 1911. $5,000,000. Four wells, Ventura County.

***OBISPO OIL COMPANY,**
P. O. Box 341, San Luis Obispo, Cal. J. W. Barneberg, President. Francis H. Throop, Secretary. February 25, 1909. $500,000. Two wells, Kern County.

OCCIDENT OIL COMPANY,
1927 Mariposa St., Fresno, Cal. Wm. Helm, President. W. O. Miles, Secretary. May 13, 1899. $32,000.

OCTAVE OIL COMPANY,
1004 Security Bldg., Los Angeles, Cal. Wm. H. Whittier, President. Thos. A. O'Donnell, Secretary. April 11, 1903. $50,000.

***OHIO CRUDE OIL COMPANY,**
346 Pacific Electric Bldg., Los Angeles, Cal. June 4, 1910. $300,000. Kern County.

***OIL EXPLORATION COMPANY OF CALIFORNIA,**
603 Nevada Bank Bldg., San Francisco, Cal. Jos. Errington, President. Jas. P. Sweeney, Secretary. August 8, 1910. $300,000. Fresno County.

***OILFIELDS SYNDICATE,**
901 Insurance Exchange, San Francisco, Cal. A. E. Boynton, President. F. J. Mott, Secretary. September 27, 1917. $250,000. One well, Santa Barbara County.

OIL LAND EXPLORATION COMPANY,
514 Humboldt Bank Bldg., San Francisco, Cal. J. P. Fraser, President. H. F. Peart, Secretary. February 23, 1909. $250,000.

***OJAI OIL COMPANY,**
315 Bumiller Bldg., Los Angeles, Cal. F. E. Dunlap, President. W. V. Ambrose, Secretary. June 4, 1900. $750,000. Four wells, Ventura County.

***OJAI VALLEY PETROLEUM COMPANY,**
207 Laughlin Bldg., Los Angeles, Cal. S. H. Watson, President. Jas. A. Haskett, Secretary. March 11, 1909. $750,000. Sixteen wells, Kern County.

OLD KEYSTONE OIL COMPANY,
1114 Union Oil Bldg., Los Angeles, Cal. Lyman Stewart, President. John McPeak, Secretary. February 15, 1897. $100,000.

OLEMA OIL COMPANY,
824 Mills Bldg., San Francisco, Cal. Oliver Ellsworth, President. M. A. Thomas, Secretary. October 2, 1900. $200,000. Kern County.

OLEUM TERRA COMPANY,
2706 Brighton Ave., Los Angeles, Cal. E. C. Freeman, President. J. G. Todd, Secretary. January 9, 1901. $16,000.

***OLIG CRUDE OIL COMPANY,**
2827 La Salle Ave., Los Angeles, Cal. Geo. W. Walker, President. J. H. Purdy, Secretary. September 28, 1904. $500,000. Seven wells, Kern County.

OLIG LAND COMPANY,
2827 La Salle Ave., Los Angeles, Cal. Geo. W. Walker, President. J. H. Purdy, Secretary. February 14, 1908. $50,000.

***OLINDA LAND COMPANY,**
702 Equitable Bldg., Los Angeles, Cal. W. H. Bailey, Jr., President. M. Sutherland, Secretary. August 31, 1900. $2,000,000. Ten wells, Orange County.

ON TOP OIL COMPANY,
1611 Las Lunas St., Pasadena, Cal. J. F. Waterman, President-acting. V. L. O'Brien, Secretary. March 29, 1915. $25,000. Kern County.

OPHIR OIL COMPANY,
310 Sansome St., San Francisco, Cal. John Barneson, President. J. Leslie Barneson, Secretary. October 7, 1909. $100,000. Fresno County. (Operated by C. B. Cates Company since September, 1918.)

***ORCUTT OIL COMPANY,**
Lompoc, Cal. A. Lehmann, President. J. A. Day, Secretary. December 31, 1907. $300,000. Five wells, Santa Barbara County.

OSAGE FIFTY-EIGHT OIL COMPANY,
1420 Orange Drive, Los Angeles, Cal. D. B. Mason, President. F. M. Overlees, Secretary. March 6, 1905. $500,000.

OTAY OIL COMPANY,
902 American National Bank Bldg., San Diego, Cal. J. W. Dougherty, President. Isabel Wyatt, Secretary. January 3, 1910. $125,000.

***OZARK OIL COMPANY,**
P. O. Box 564, Los Angeles, Cal. W. P. James, President. O. H. Burke, Secretary. July 18, 1907. $250,000. Four wells, Fresno County.

OZENA OIL COMPANY,
231 E. Sixth St., Los Angeles, Cal. Hugh Scott, President. Albert Lane, Secretary. April 17, 1916. $200,000.

***PACIFIC CRUDE OIL COMPANY,**
112 Market St., San Francisco, Cal. G. N. Easton, President. John Lee, Jr., Secretary. May 19, 1911. $750,000. Three wells, Kern County.

***PACIFIC MIDWAY OIL COMPANY,**
822 Mills Bldg., San Francisco, Cal. B. S. Noyes, President. Benjamin Romaine, Secretary. January 31, 1910. $250,000. Five wells, Kern County.

PACIFIC OILFIELDS LIMITED,
350 California St., San Francsco, Cal. A. B. Williamson, President. F. W. Bishop, Secretary. December 23, 1907. £250,000. San Luis Obispo County and Santa Barbara County.

***PACIFIC STATES PETROLEUM COMPANY,**
P. O. Box "B2," Coalinga, Cal. G. W. Richard, President. L. L. Richard, Secretary. April 23, 1909. $300,000. One well, Fresno County.

PALMER ANNEX OIL COMPANY,
1000 Title Insurance Bldg., Los Angeles, Cal. Shirley E. Meserve, President. J. R. Whittemore, Secretary. June 5, 1909. $2,000,000.

***PALMER UNION OIL COMPANY,**
Box 202, Santa Barbara, Cal. J. M. Williamson, President. M. F. Lewis, Secretary. December 5, 1910. $10,000,000. Five wells, Kern County; 7 wells, Santa Barbara County.

***PAN AMERICAN PETROLEUM COMPANY,**
1015 Security Bldg., Los Angeles, Cal. E. L. Doheny, President. O. D. Bennett, Secretary. September 11, 1916. $1,000,000. Fifty-three wells, Kern County; 29 wells, Ventura County.

***PAN AMERICAN PETROLEUM INVESTMENT CORPORATION,**
1015 Security Bldg., Los Angeles, Cal. E L. Doheny, President. O. D. Bennett, Secretary. October 30, 1916. $5,000,000. Five wells, Santa Barbara County.

***PANTHEON OIL COMPANY,**
55 New Montgomery St., San Francisco, Cal. A. C. McLaughlin, President. P. G. Williams, Secretary. February 28, 1910. $750,000. Seven wells, Fresno County.

***PARAFFINE OIL COMPANY,**
Box 556, Bakersfield, Cal. H. F. Condict, President. T. H. Minor, Secretary. January 24, 1901. $300,000. Five wells, Kern County.

PARAFFIN OIL PRODUCTS COMPANY,
Care John M. Cannon, 901 Hollingsworth Bldg., Los Angeles, Cal. July 26, 1917. $200,000.

PARAISO OIL COMPANY,
Syndicate Bldg., Oakland, Cal. J. E. Ennis, President. J. N. Turner, Secretary. September 18, 1914. $200,000.

PARKER OIL COMPANY,
208 Van Ness Ave., Los Angeles, Cal. Nettie A. Parker, President. M. F. Klingaman, Secretary. May 16, 1900. $250,000.

***PATRICIA OIL COMPANY,**
P. O. Box 441, Bakersfield, Cal. F. A. Carrick, President. A. C. Tupman, Secretary. May 21, 1910. $250,000. Seventeen wells, Kern County.

PAUSON OIL COMPANY,
180 Sutter St., San Francisco, Cal. S. B. Pauson, President. J. W. Pauson, Secretary. November 5, 1904. $100,000.

P. C. L. OIL COMPANY,
111 N. Church St., Visalia, Cal. Care Chas. G. Lamberson. Geo. T. Parr, President. John Cutler, Secretary. November 26, 1909. $100,000.

***PEERLESS OIL COMPANY,**
824 Crocker Bldg., San Francisco, Cal. T. C. Petersen, President. H. C. Park, Secretary. October 9, 1899. $1,000,000. Sixty-five wells, Kern County. (Now operated by Arizona Oil Company.)

***PENN COALINGA PETROLEUM COMPANY,**
607 First National Bank Bldg., San Francisco, Cal. I. L. Bryner, President. Robt. Hays Smith, Secretary. June 26, 1905. $350,000. Ten wells, Fresno County.

PENTLAND UNION PETROLEUM COMPANY,
401 Union Oil Bldg., Los Angeles, Cal. Edward Fox, President. F. C. Lamb, Secretary. June 29, 1912. $15,000.

PERSEUS OIL COMPANY,
207 S. Broadway, Los Angeles, Cal. T. Dudley, President. W. H. Dowsing, Secretary. March 7, 1901. $200,000. Kern County.

PETROL COMPANY, THE,
Santa Susana, Cal. W. S. Baylis, Secretary. Ventura County. (Dissolved.)

PETROL CORPORATION OF AMERICA, THE,
Care Robt. M. Clarke, 918 Merchants National Bank Bldg., Los Angeles, Cal. July 17, 1918. $250,000.

***PETROLEUM COMPANY, THE,**
407-8 Consolidated Realty Bldg., Los Angeles, Cal. M. H. Mosier, President. Chas. T. Wilson, Secretary. September 30, 1910. $250,000. Four wells, Orange County.

***PETROLEUM DEVELOPMENT COMPANY,**
756 Kerckhoff Bldg., Los Angeles, Cal. E. O. Faulkner, President. G. Holterhoff, Jr., Secretary. May 26, 1899. $125,000. Sixty-nine wells, Orange County; 118 wells, Kern County.

***PETROLEUM MIDWAY COMPANY, LTD.,**
1034 Security Bldg., Los Angeles, Cal. W. D. Stewart, Vice President. Norman Bridge, Secretary. February 15, 1915. $1,000,000. Ten wells, Kern County.

PETROLIA OIL COMPANY,
Tulare and J Sts., Tulare, Cal. A. W. Wheeler, President. W. A. Higgins, Secretary. June 29, 1899. $50,000.

PHOENIX OIL COMPANY,
P. O. Box 416, Hanford, Cal. P. McRae, President. W. R. McQuiddy, Secretary. November 28, 1898. $100,000.

PIEDMONT OIL COMPANY,
1206 Broadway, Oakland, Cal. A. H. Breed, President. H. L. Breed, Secretary. December 17, 1900. $4,000. Kern County. (Property sold; now operated by A. S. Crites.)

PIERCE PETROLEUM COMPANY,
Care Herman Layer & Company, Hobart Bldg., San Francisco, Cal. December 4, 1918. $1,000,000.

***PIERPONT OIL COMPANY,**
Box 196, Los Angeles, Cal. Wm. Hardee, President. F. W. Black, Secretary. March 29, 1909. $500,000. Twelve wells, Kern County.

***PILOT OIL COMPANY,**
607 First National Bank Bldg., San Francisco, Cal. H. J. Doulton, President. G. A. Scott, Secretary. May 9, 1908. $100,000, Orig.; $200,000, Inc. Seven wells, Fresno County.

PINAL DOME OIL COMPANY,
Santa Maria, Cal. J. F. Goodwin, President. Geo. P. Merritt, Secretary. June 21, 1912. $360,000. (Property sold to Union Oil Company.)

PINE RIDGE PETROLEUM COMPANY,
Coalinga, Cal. M. L. Boles, President. J. A. Fluetsch, Secretary. May 8, 1917. $50,000.

PIONEER MIDWAY OIL COMPANY,
411 Montgomery St., San Francisco, Cal. I. Strasburger, President. A. E. Cole, Secretary. August 17, 1907. $1,000,000.

***PIONEER MIDWAY OIL COMPANY, CONSOLIDATED,**
55 New Montgomery St., San Francisco, Cal. Wm. Sproule, President. P. G. Williams, Secretary. June 13, 1910. $2,000,000. Two wells, Kern County.

PIRU OIL COMPANY,
300 Crocker Bldg., San Francisco, Cal. W. Gregg, Jr., President. W. R. Berry, Secretary. January 21, 1887. $100,000.

***PITTSBURGH BELRIDGE OIL COMPANY,**
454 California St., San Francisco, Cal. Fentress Hill, Vice President. Wendell S. Kuhn, Secretary. April 12, 1912. $250,000. Kern County.

PITTSBURGH OIL AND GAS COMPANY,
Bakersfield, Cal. Care R. A. Broomfield. April 9, 1918. $2,000,000.

PITTSBURGH PACIFIC OIL COMPANY,
410 Brower Bldg., Bakersfield, Cal. Care R. A. Broomfield. June 4, 1914. $1,000,000.

PLACERITA PETROLEUM COMPANY, THE,
Care Routhe & Hinman, 307 Exchange Bldg., Los Angeles, Cal. October 18, 1918. $200,000.

PLEASANT VALLEY OIL COMPANY, LTD.,
Care Universal Oil Company, Lost Hills, Cal. T. A. Crumpton, President. I. M. Conkey, Secretary. August 16, 1911. $15,000.

PLEYTO CONSOLIDATED OIL COMPANY,
333 Kearny St., San Francisco, Cal. C. W. Jackson, President. J. C. Currier, Secretary. April 15, 1912. $400,000.

POMONA OIL COMPANY,
Care E. B. Core, 943 Title Insurance Bldg., Los Angeles, Cal. September 23, 1918. $500,000.

PORTOLA OIL COMPANY,
798 Minnesota St., San Francisco, Cal. Geo. P. Moore, President. N. A. Robinson, Secretary. June 11, 1917. (No par value.)

POSO CREEK OIL COMPANY,
Care S. L. Mack, Southern Hotel, Bakersfield, Cal. S. P. Wible, President. S. L. Mack, Secretary. November 22, 1899. $100,000. (Dissolved.)

POSTON OIL COMPANY,
Box 354, Santa Clara, Cal. J. C. Sutherland, President. G. E. Hamilton, Secretary. October 29, 1899. $30,000.

***POTTER OIL COMPANY OF CALIFORNIA,**
410 Brower Bldg., Bakersfield, Cal. Robt. Law, Jr., President. J. H. Healey, Secretary. April 26, 1915. $500,000. Thirty-one wells, Kern County.

***PRAIRIE OIL COMPANY,**
Care Alex. Work, President, Bakersfield Club, Bakersfield, Cal. T. V. Daub, Secretary. April 14, 1916. $50,000. One well, Kern County.

***PREMIER OIL COMPANY,**
516 Citizens National Bank Bldg., Los Angeles, Cal. T. Spellacy, President. B. H. Wallace, Secretary. September 5, 1907. $1,000,000. Sixteen wells, Fresno County.

***PRICEWELL OIL COMPANY,**
Wilcox Bldg., Los Angeles, Cal. A. D. Elwell, President. C. E. Price, Secretary. March 20, 1909. $50,000. Eight wells, Kern County.

***PRINCETON OIL COMPANY,**
208 Brower Bldg., Bakersfield, Cal. H. A. Jastro, President. C. A. Barlow, Secretary. January 7, 1913. $50,000. Three wells, Kern County.

PRODUCERS OIL COMPANY, GUARANTEED,
1945 Tulare St., Fresno, Cal. B. F. Shepherd, Jr., President. N. G. Cochrane, Secretary. October 25, 1899. $500,000. Kern County.

***PROVIDENTIAL OIL COMPANY,**
320 Timkin Bldg., San Diego, Cal. A. J. Bradley, President. J. A. Smith, Secretary. October 5, 1914. $1,000,000. Three wells, Orange County.

PROVIDENT OIL MINING COMPANY,
758 Market St., San Francisco, Cal. Dr. A. McFayden, President. C. E. Allis, Secretary. November 26, 1900. $300,000. Kern County.

PUENTE OIL COMPANY,
1005 Central Bldg., Los Angeles, Cal. Wm. R. Rowland, President. W. Astley, Secretary. January 22, 1892. $250,000.

PURE OIL COMPANY OF SANTA PAULA,
512 S. Broadway, Los Angeles, Cal. J. W. Young, President. Philip Forve, Secretary. June 4, 1900. $300,000.

PURISSIMA HILLS OIL COMPANY,
349 Rialto Bldg., San Francisco, Cal. Howard A. Broughton, President. James Casey, Secretary. October 31, 1908. $1,000,000.

PURITAN OIL COMPANY,
501 I. W. Hellman Bldg., Los Angeles, Cal. W. J. Wallace, President. Harry J. Bauer, Secretary. March 22, 1916. $100,000.

***PYRAMID OIL COMPANY,**
716 Phelan Bldg., San Francisco, Cal. G. S. Johnson, President. Otto B. Johnson, Secretary. October 7, 1909. $1,000,000. Five wells, Kern County; 13 wells, Ventura County.

***QUEEN OIL COMPANY,**
Care First National Bank, Los Angeles, Cal. W. N. Hamaker, Secretary. Three wells, Fresno County.

***QUINTUPLE OIL COMPANY,**
388 Consolidated Realty Bldg., Los Angeles, Cal. R. J. Gaffney, President. A. E. Hurley, Secretary. July 30, 1914. $100,000. Two wells, Orange County.

RADIUM OIL COMPANY,
110 Montgomery St., San Francisco, Cal. Chas. Sutro, President. Sidney L. Schwartz, Secretary. April 29, 1904. $250,000.

***RANCHO LA BREA OIL COMPANY,**
Merchants National Bank Bldg., Los Angeles, Cal. G. Allan Hancock, Executor. Fifty-eight wells, Los Angeles County.

RAMBLER OIL COMPANY,
616 Union Oil Bldg., Los Angeles, Cal. M. V. McQuigg, President. A. J. Wallace, Secretary. June 17, 1908. $50,000. (Property operated by Traders Oil Company.)

***RECORD OIL COMPANY,**
264 Southern Pacific Bldg., San Francisco, Cal. H. H. Hart, President. W. J. Clark, Secretary. March 3, 1905. $200,000. Eight wells, Fresno County.

***RECOVERY OIL COMPANY,**
510 Crocker Bldg., San Francisco, Cal. Geo. T. Cameron, President. R. A. Morton, Secretary. December 2, 1910. $1,000,000. Four wells, Kern County.

RECRUIT OIL COMPANY,
55 New Mongomery St., San Francisco, Cal. Wm. Sproule, President. P. G. Williams, Secretary. May 4, 1903. $1,000,000. Santa Barbara County.

RED MAN PETROLEUM COMPANY,
3096 California St., San Francisco, Cal. A. A. Cohn, President. W. I. Sterett, Secretary. October 27, 1911. $300,000.

***RED STAR PETROLEUM COMPANY,**
1034 Security Bldg., Los Angeles, Cal. T. A. O'Donnell, President. W. D. Stewart, Secretary. June 8, 1917. $500,000. One well, Los Angeles County.

REFINING AND PRODUCING OIL COMPANY,
354 Pine St., San Francisco, Cal. L. A. Phillips, President. R. A. Broomfield, Secretary. May 4, 1911. $2,250,000.

REGAL OIL COMPANY,
226-227 Security Bldg., Los Angeles, Cal. E. E. Dunlap, President. G. C. Dennis, Secretary. September 12, 1908. $100,000. Kern County.

REPUBLIC OIL COMPANY,
1118 Hearst Bldg., San Francisco, Cal. S. A. Guiberson, Jr., President. B. H. Henderson, Secretary. February 2, 1910. $6,000. (Dissolved.)

RESULT OIL COMPANY,
1016 American National Bank Bldg., San Francisco, Cal. P. E. Bowles, President. F. W. McNear, Secretary. March 6, 1908. $25,000.

***REVENUE OIL COMPANY,**
409 Citizens Savings Bank Bldg., Pasadena, Cal. R. H. Pinney, President. A. K. Nash, Secretary. March 7, 1900. $200,000. Eight wells, Kern County.

***REWARD OIL COMPANY,**
1016 American National Bank Bldg., San Francisco, Cal. P. E. Bowles, President. F. W. McNear, Secretary. March 9, 1901. $100,000. Forty-seven wells, Kern County.

RHODES, F. C.,
McFarland, Cal. Devil's Den.

***RHOADS & SCHMITT,**
Alma, Cal. Wm. Rhoads, Manager. One well, Santa Clara County.

***RICE RANCH OIL COMPANY,**
710 Merchants National Bank Bldg., Los Angeles, Cal. C. J. Kubach, President. E. A. Rang, Secretary. March 14, 1904. $300,000. Thirteen wells, Santa Barbara County.

RICHFIELD OIL COMPANY,
933 Van Nuys Bldg., Los Angeles, Cal. F. R. Kellogg, President. G. J. Syminton, Secretary. November 29, 1911. $300,000.

RICHFIELD PETROLEUM COMPANY,
Care Pillsbury, Madison & Sutro, Standard Oil Bldg., San Francisco, Cal. June 21, 1918. $500,000.

RIO BRAVO OIL COMPANY,
Care Wm. Palmtag, Hollister, Cal. Geo. D. Clark, President. Walter C. Graves, Secretary. February 14, 1900. $100,000.

RIO HONDO PETROLEUM COMPANY,
Room 614, 453 S. Spring St., Los Angeles, Cal. Care Goodwin & Morgrage. November 1, 1917. $300,000.

RIVA OIL AND GAS COMPANY,
617 Merritt Bldg., Los Angeles, Cal. M. H. Whittier, President. Fred Sutton, Secretary. July 8, 1918. $500,000.

RIVERSIDE PORTLAND CEMENT COMPANY,
640 Title Insurance Bldg., Los Angeles, Cal.

ROANOKE OIL COMPANY,
Room 3, Farmers National Bank, Fresno, Cal. Care G. L. Warlow, Secretary. C. S. Pierce, President. December 24, 1900. $100,000.

***ROCK OIL COMPANY,**
1007 Washington Bldg., Los Angeles, Cal. L. C. Torrance, President. Nichols Milbank, Secretary. April 7, 1910. $125,000. Seven wells, Kern County.

ROOT, SHOUP & MILLIKEN,
Pacific Electric Bldg., Los Angeles, Cal. ("Wildcat" well, Kern County.)

ROSE OIL COMPANY,
600 S. Broadway, Los Angeles, Cal. Frederick J. Mullen, President. James B. Sullivan, Secretary. July 6, 1903. $200,000.

***ROSE OIL COMPANY,**
Fillmore, Cal. C. E. Ingalls, President. One well, Ventura County.

ROYAL PETROLEUM COMPANY, LTD.,
330 Merchants National Bank Bldg., Los Angeles, Cal. Lester H. Miles, President. Lester M. Gray, Secretary. June 29, 1917. $9,600.

R. T. OIL COMPANY,
Care G. S. Thurman, Madera, Cal. W. B. Thurman, President. G. S. Thurman, Secretary. September 19, 1910. $150,000.

***RUBY OIL COMPANY, THE,**
1008 Security Bldg., Los Angeles, Cal. J. W. Jameson, President. George L. Reynolds, Secretary. February 13, 1908. $300,000. Ten wells, Kern County.

***SAFE OIL COMPANY,**
208 Brower Bldg., Bakersfield, Cal. C. A. Barlow, President. W. H. Hill, Secretary. March 1, 1907. $100,000. Four wells, Kern County.

SAFETY OIL COMPANY,
Delger Bldg., Fourteenth and Broadway, Oakland, Cal. G. Erwin Brinckerhoff, President. M. V. Cooley, Secretary. March 8, 1901. $300,000, Orig.; $17,500, Dec.

***SALT LAKE OIL COMPANY OF CALIFORNIA,**
55 New Montgomery St., San Francisco, Cal. Wm. Sproule, President. P. G. Williams, Secretary. November 27, 1903. $500,000. One hundred seven wells, Los Angeles County.

***SALTMARSH CANON OIL COMPANY,**
P. O. Box 44, Santa Paula, Cal. A. M. Dunham, President. F. H. Dunham, Secretary. September 24, 1902. $20,000, Orig.; $50,000 Inc. Five wells, Ventura County.

***SALVIA OIL COMPANY,**
1004 Security Bldg., Los Angeles, Cal. Thos. A. O'Donnell, President. Ellis T. Yarnell, Secretary. November 3, 1915. $10,000. Fourteen wells, Fresno County.

SAMSONIAN OIL COMPANY,
First National Bank Bldg., Oakland, Cal. Care H. B. Griffith. March 19, 1917. $25,000.

SAN ANTONIO OIL AND LAND COMPANY,
348 Hayes St., San Francisco, Cal. James R. Little, President. A. W. Craig, Secretary. March 19, 1900. $100,000.

SAN BERNARDINO VALLEY OIL COMPANY,
San Bernardino, Cal. A. E. Perris, President. D. M. Perris, Secretary. December 2, 1912. $25,000.

SAN CARLOS OIL COMPANY,
200 McAllister St., San Francisco, Cal. H. L. Funk, President. H. B. Hambly, Secretary. February 19, 1892. $1,000,000, Orig.; $100,000, Dec.

SAN DIEGO AND IMPERIAL VALLEY OIL COMPANY,
American Bank Bldg., San Diego, Cal. Care Bernard & Malcomber. March 21, 1917. $25,000.

SAN DIEGO AND TEXAS OIL COMPANY,
Care John J. Brennan, San Diego, Cal. July 15, 1918. $200,000.

***SAN DIEGO CONSOLIDATED OIL COMPANY,**
Owl Drug Bldg., San Diego, Cal. P. M. Johnson, President. George H. Hughes, Secretary. May 3, 1915. $500,000. Two wells, Orange County.

SAN DIEGO OIL COMPANY,
Care John F. McVean, 2637 Logan Ave., San Diego, Cal. John F. McVean, President. H. C. Barnes, Secretary. October 28, 1916. $50,000.

***SAN FRANCISCO AND McKITTRICK OIL COMPANY,**
607 Monadnock Bldg., San Francisco, Cal. H. U. Maxfield, President. Walter C. Beatie, Secretary. December 11, 1899. $500,000. Seventeen wells, Kern County.

SAN FRANCISCO AND WYOMING OIL COMPANY,
67 Buena Vista Terrace, San Francisco, Cal. F. J. Baird, President. Wm. J. Drew, Secretary. August 15, 1913. $200,000.

***SAN FRANCISCO MIDWAY OIL COMPANY,**
660 Market St., San Francisco, Cal. G. F. Lyon, President. W. S. Oliver, Secretary. March 25, 1910. $500,000. One well, Kern County.

***SAN FRANCISCO PETROLEUM COMPANY,**
Room 401, 110 Market St., San Francisco, Cal. March 22, 1918. $1,000,000.

SAN GABRIEL PETROLEUM COMPANY,
1117 Title Insurance Bldg., Los Angeles, Cal. Care Goodwin & Morgrage. June 28, 1917. $100,000. (Dissolved.) (Property operated by Petroleum Midway Co., Ltd.)

SAN JUAN OIL COMPANY,
1910 Mariposa St., Fresno, Cal. W. B. Holland, President. Ben Epstein, Secretary. March 5, 1909. $25,000. Fresno County.

***SANTA CLARA OIL AND DEVELOPMENT COMPANY,**
719 Story Bldg., Los Angeles, Cal. L. C. Throop, President. G. H. Kleinhans, Secretary. February 9, 1912. $1,000,000. One well, Ventura County.

***SANTA MARIA CRUDE OIL COMPANY,**
622 Bumiller Bldg., Los Angeles, Cal. W. V. Ambrose, President. Chas. F. Off, Secretary. December 29, 1906. $500,000. One well, Ventura County.

SANTA MARIA ENTERPRISE OIL COMPANY,
613 Hibernian Bank, Los Angeles, Cal. Care G. E. Bittinger, President. December 15, 1909. $400,000.

***SANTA MARIA OIL FIELDS, INC.,**
Box 638, Santa Maria, Cal. Carroll W. Gates, President. Jay Spence, Secretary. March 14, 1916. $2,250,000. Three wells, Santa Barbara County.

***SANTA PAULA OIL COMPANY,**
433 California St., San Francisco, Cal. Chas. W. Gardner, President. A. E. Boynton, Secretary. October 13, 1916. $100,000. Two wells, Ventura County.

SANTA PAULA Y SATICOY OIL COMPANY,
319 Kohl Bldg., San Francisco, Cal. William Whitney, President. A. C. Hellman, Secretary. March 28, 1903. $100,000.

SANTA SUSANA OIL CORPORATION,
1101 Hollingsworth Bldg., Los Angeles, Cal. I. H. Lehman, President. Hobart M. De Lanoie, Secretary. November 30, 1917. $3,000,000.

***SANTA SUSANA SYNDICATE,**
1201 Hollingsworth Bldg., Los Angeles, Cal. Dr. A. Hirschi, President. Eleven wells, Ventura County. (Property taken over by Santa Susana Oil Corporation.)

SAUER DOUGH OIL COMPANY,
510 Crocker Bldg., San Francisco, Cal. Geo. T. Cameron, President. R. A. Morton, Secretary. January 7, 1901. $50,000. Fresno County.

***SCARAB OIL COMPANY,**
344 Fifth St., Oxnard, Cal. W. L. Dunn, President. H. R. Staples, Secretary. March 1, 1909. $100,000. One well, Ventura County. (Property of Union Oil Company; pumped by Scarab Oil Company on royalty.)

SEABOARD OIL AND TRANSIT COMPANY,
1101 Story Bldg., Los Angeles, Cal. C. L. Flack, President. A. F. Clark, Secretary. December 28, 1911. $1,000,000.

***SEASIDE OIL COMPANY,**
310 Sansome St., San Francisco, Cal. H. J. Hart, President. L. C. Cook, Secretary. February 24, 1898. $200,000, Orig.; $10,000 Dec. Eleven wells, Santa Barbara County.

***SECTION FIVE OIL COMPANY,**
255 Holbrook Bldg., San Francisco, Cal. F. L. Lezinsky, President. S. G. O. King, Secretary. December 3, 1900. $75,000, Orig.; $150,000, Inc. Eight wells, Kern County.

SECTION ONE OIL COMPANY,
502 Balboa Bldg., San Francisco, Cal. Care O. G. Meyers, Secretary. T. A. O'Donnell, President. August 14, 1907. $10,000.

***SECTION SEVEN OIL COMPANY,**
607 First National Bank Bldg., San Francisco, Cal. W. J. Boiner, President. H. E. Sherbley, Secretary. June 26, 1905. $300,000. Four wells, Fresno County.

***SECTION TEN OIL COMPANY,**
Ben Williams, President. Coalinga, Cal. One well, Fresno County.

SECTION THREE OIL COMPANY,
Care G. S. Thurman, Madera, Cal. W. B. Thurman, President. G. S. Thurman, Secretary. February 23, 1911. $150,000.

SECTION TWELVE OIL COMPANY,
Care Jordan & Jordan, Bakersfield, Cal. April 4, 1911. $50,000.

***SECTION TWENTY-FIVE OIL COMPANY,**
208 Brower Bldg., Bakersfield, Cal. T. E. Sullivan, President. C. A. Barlow, Secretary. September 28, 1903. $40,000. Thirty-two wells, Kern County.

***SECURITY DEVELOPMENT COMPANY,**
P. O. Box 813, Bakersfield, Cal. E. D. Burge, President. C. H. Franey, Secretary. April 29, 1913. $50,000. Nine wells, Kern County.

SECURITY OIL COMPANY,
1004 Title Insurance Bldg., Los Angeles, Cal. Care E. A. Hawkins, Secretary. O. C. Edwards, President. October 19, 1916. $200,000. Kern County.

***SENECA OIL COMPANY,**
1133 Divisadero St., Fresno, Cal. Geo. L. Warlow, President. W. T. Knowles, Secretary. April 20, 1908. $250,000. Six wells, Fresno County.

***SESNON OIL COMPANY,**
58 Sutter St., San Francisco, Cal. W. T. Sesnon, President. G. W. Fanning, Secretary. February 17, 1908. $100,000. Fifteen wells, Kern County.

***SHANDON OIL COMPANY,**
P. O. Box 400, Caldwell, N. J. Alexander Dallas, President. P. Beaton, Secretary. February 19, 1913. $750,000. Fresno County.

SHAW RANCH OIL COMPANY,
Box 638, Santa Maria, Cal. Oliver C. Edwards, President. Jay Spence, Secretary. September 18, 1912. $2,000,000. Santa Barbara County.

***SHELL COMPANY OF CALIFORNIA,**
343 Sansome St., San Francisco, Cal. W. Meischke-Smith, President. R. A. Lewin, Secretary. July 30, 1915. $45,000,000. Two wells, Ventura County; 232 wells, Fresno County.

SHIRLEY OIL COMPANY,
421 N. Main St., Santa Ana, Cal. John W. Shirley, President. J. G. Quick, Secretary. January 7, 1903. $10,000.

SHREEVES OIL COMPANY, THE,
55 New Montgomery St., San Francisco, Cal. Wm. Sproule, President. P. G. Williams, Secretary. July 26, 1906. $200,000. (Dissolved.)

SIBYL OIL COMPANY,
1003 Higgins Bldg., Los Angeles, Cal. J. W. Maddrill, President. C. R. Stevens, Secretary. October 11, 1909. $50,000. Kern County.

SILVER TIP OIL COMPANY,
923-924 Van Nuys Bldg., Los Angeles, Cal. S. A. Guiberson, Jr., President. E. L. Sargent, Asst. Secretary. February 25, 1909. $750.

***SLOCUM, THOS. A.,**
543 Bradbury Bldg., Los Angeles, Cal. Ten wells, Ventura County. (Operating as Slocum & Company.)

***SNOOK, WALTER,**
Maricopa, Cal. Four wells, Kern County.

SOUTH COAST OIL COMPANY,
349 Rialto Bldg., San Francisco, Cal. James Casey, President. A. J. Porter, Secretary. July 10, 1913. $1,000,000.

SOUTHEASTERN LIMITED OIL COMPANY,
Room 637, 58 Sutter St., San Francisco, Cal. Louis Nathan, President. Chas. G. Wilcox, Secretary. September 30, 1908. $500,000.

***SOUTHERN CALIFORNIA EDISON COMPANY,**
120 East Fourth St., Los Angeles, Cal. W. A. Brackenridge, President. S. M. Kennedy, Secretary. July 6, 1909. $100,000,000. Forty wells, Los Angeles County.

***SOUTHERN CALIFORNIA GAS COMPANY,**
809 Garland Bldg., Los Angeles, Cal. Wm. G. Kerckhoff, President. L. M. Farnham, Secretary. October 3, 1910. $10,000,000. Seven wells, Kern County.

SOUTHERN CALIFORNIA OIL SYNDICATE, LTD.,
Bank of Lompoc Bldg., Lompoc, Cal. Care W. J. Packard. April 23, 1907. £25,000.

***SOUTHERN PACIFIC COMPANY,**
65 Market St., San Francisco, Cal. Wm. Sproule, President. A. D'Heur, Manager, Fuel Oil Department. One hundred thirty-nine wells, Fresno County; 446 wells, Kern County.

SOUTHERN PETROLEUM COMPANY OF CALIFORNIA, THE,
1113 Hibernian Bldg., Los Angeles, Cal. Care Lyle W. Rucker. January 7, 1918. $1,000,000.

SOUTH MIDWAY OIL COMPANY,
418 Chamber of Commerce Bldg., Los Angeles, Cal. Julius Fried, President. W. W. Worthing, Secretary. April 15, 1910. $1,000,000.

SOUTH MOUNTAIN OIL COMPANY,
435 Security Bldg., Los Angeles, Cal. R. Mansard, President. A. L. Jamison, Secretary. October 20, 1913. $300,000.

***SOUTH PACIFIC OIL COMPANY,**
637 Consolidated Realty Bldg., Los Angeles, Cal. A. I. Smith, Manager. Twelve wells, Ventura County. (Copartnership.)

***SOVEREIGN OIL COMPANY,**
585 Market St., San Francisco, Cal. Wm. Ellery, President. J. W. Ellery, Secretary. October 15, 1900. $500,000. Eleven wells, Kern County.

***SPELLACY & THOMPSON,**
I. W. Hellman Bldg., Los Angeles, Cal. Kern County.

***SPINKS CRUDE OIL COMPANY,**
P. O. Box 598, Monrovia, Cal. Wm. A. Spinks, President. Walter F. Dunn, Secretary. November 3, 1909. $200,000. Eight wells, Fresno County.

SPOCO OIL COMPANY OF LOS ANGELES,
Care O'Melveny, Milliken & Fuller, 825 Title Insurance Bldg., Los Angeles, Cal. February 21, 1918. $75,000.

S. P. PLACER MINING COMPANY,
1511 Eighteenth St., Bakersfield, Cal. J. E. Collins, President. Fred Gunther, Secretary. September 8, 1899. $200,000.

***SPRECKELS OIL COMPANY,**
60 California St., San Francisco, Cal. J. D. Spreckels, Jr., President. G. B. Waterman, Secretary. November 1, 1911. $200,000. Four wells, Kern County.

SQUAW FLAT OIL COMPANY,
401 Union Oil Bldg., Los Angeles, Cal. A. J. Aber, President. B. M. Howe, Secretary. August 11, 1910. $200,000.

***STANDARD OIL COMPANY,**
Standard Oil Bldg., San Francisco, Cal. W. S. Rheem, President. H. M. Storey, Secretary. September 10, 1879. $100,000,000. One hundred thirty-three wells, Fresno County; 451 wells, Kern County; 152 wells, Los Angeles County; 50 wells, Orange County.

STAR NEWHALL OIL COMPANY,
Care Jacob Weinberger, 513 American National Bank Bldg., San Diego, Cal. September 28, 1918. $50,000.

***STATE CONSOLIDATED OIL COMPANY,**
912 Baker-Detwiler Bldg., Los Angeles, Cal. E. J. Miley, President. A. M. Buley, Secretary. March 3, 1911. $1,250,000. One well, Ventura County; 32 wells, Kern County.

STATE OIL COMPANY OF CALIFORNIA,
310 Sansome St., San Francisco, Cal. John Barneson, President. J. Leslie Barneson, Secretary. February 15, 1910. $200,000.

***STAUFFER OIL COMPANY,**
624 California St., San Francisco, Cal. C. de Guigne, President. C. Jantzen, Secretary. May 19, 1909. $100,000. Six wells, Kern County.

***STEPHENS DRILLING ACCOUNT,**
Merchants National Bank Bldg., Los Angeles, Cal. Moye W. Stephens, Manager. One well, Los Angeles County.

***STERLING OIL AND DEVELOPMENT COMPANY,**
55 New Montgomery St., San Francisco, Cal. Alden Anderson, President. P. G. Williams, Secretary. October 30, 1899. $250,000. Forty-one wells, Kern County.

***ST. HELENS PETROLEUM COMPANY, LTD., THE,**
1117 L. A. Investment Bldg., Los Angeles, Cal. H. H. Haldin, Chairman. R. H. Young, Secretary. R. W. Stephens, Los Angeles, Secretary. May 10, 1913. $1,200,000. Twenty-five wells, Kern County; 13 wells, Orange County.

***ST. LAWRENCE OIL COMPANY,**
411 Montgomery St., San Francisco, Cal. I. Strassburger, President. A. E. Cole, Secretary. April 14, 1908. $100,000. Seven wells, Kern County.

***STOCKTON MIDWAY OIL COMPANY,**
309 E. Main St., Stockton, Cal. Geo. F. Hudson, President. C. F. Campbell, Secretary. December 8, 1910. $1,000,000. Five wells, Kern County.

***ST. PAUL CONSOLIDATED OIL COMPANY,**
Farmers National Bank Bldg., Fresno, Cal. Geo. L. Warlow, President. W. T. Knowles, Secretary. September 24, 1910. $600,000. Seven wells, Fresno County.

ST. PAUL-FRESNO OIL COMPANY,
1133 Divisadero St., Fresno, Cal. Geo. L. Warlow, President. W. T. Knowles, Secretary. June 5, 1903. $250,000.

***STRONG OIL COMPANY,**
1015 Marsh-Strong Bldg., Los Angeles, Cal. Frank P. Strong. Three wells, Fresno County. (Co-partnership.) (From June to August, 1918, property operated by Harris & Cates. From September, 1918, property operated by C. B. Cates Co.)

STURGEON OIL COMPANY,
Care J. A. Turner, Santa Ana, Cal. J. A. Turner, President. I. D. Mills, Secretary. January 11, 1901. $300,000, Orig.; $50,000, Dec. Kern County.

SUBMARINE OIL COMPANY,
Box 477, Santa Barbara, Cal. R. H. Herron, President. F. I. Herron, Secretary. August 25, 1917. $25,000.

SUCCESSUS OIL COMPANY,
1526-32 Twentieth St., Bakersfield, Cal. Louis V. Olcese, President. Gus. Schamblin, Secretary. October 6, 1911. $150,000. Kern County.

***SUDDEN & EMSLIE,**
Care R. C. Sudden. Ventura, Cal. Three wells, Ventura County.

SUDDEN OIL COMPANY,
Lompoc, Cal. T. F. Fox, President. John C. Lind, Secretary. March 5, 1910. $300,000.

SULLIVAN, Wm.
San Gabriel, Cal. One well, Los Angeles City.

SULPHUR MOUNTAIN PETROLEUM COMPANY,
Fullerton, Cal. Wm. Starbuck, President. July 13, 1900. $800,000.

SUNBEAM OIL COMPANY,
724 Trust & Savings Bldg., Los Angeles, Cal. R. B. Blodget, President. Nichols Milbank, Secretary. July 17, 1916. $100,000. Kern County.

***SUNCREST OIL COMPANY,**
617 Merritt Bldg., Los Angeles, Cal. Burton E. Green. President. F. B. Sutton, Secretary. September 5, 1916. $50,000. One well, Kern County.

SUNPARK OIL COMPANY,
617 Merritt Bldg., Los Angeles, Cal. Burton E. Green, President. F. B. Sutton, Secretary. December 19, 1910. $100,000.

***SUNSET EXTENSION OIL COMPANY,**
Garland Bldg., Los Angeles, Cal. Harry M. Wier, President. Geo. E. Mills, Secretary. May 23, 1910. $300,000. One well, Kern County.

***SUNSET MONARCH OIL COMPANY,**
60 California St., San Francisco, Cal. G. P. Ayers, President. Geo. A. Douglass, Secretary. December 10, 1906. $500,000. Kern County. (Property leased to Standard Oil Company, February 14, 1917.)

SUNSET OIL COMPANY, THE,
26 W. Arallaga St., Santa Barbara, Cal. F. A. Conant, President. Y. C. Hassinger, Secretary. June 21, 1899. $50,000. Kern County.

SUNSET ROAD OIL COMPANY,
Box 478, Maricopa, Cal. John Bennett, President. E. R. Hough, Secretary. June 22, 1905. $2,500,000. Kern County.

SUNSET VENTURA OIL COMPANY,
Care Ogden & Esteb, 711 American Bank Bldg., Los Angeles, Cal. March 11, 1918. $300,000.

SUNSHINE OIL COMPANY,
Woodland, Cal. Care J. M. Day. July 15, 1910. $150,000.

SURF OIL COMPANY,
1114 Union Oil Bldg., Los Angeles, Cal. W. L. Stewart, President. John McPeak, Assistant Secretary. December 19, 1902. $500,000.

SUSSEX OIL COMPANY,
Room 411, 332 Pine St., San Francisco, Cal. F. E. Fitzpatrick, President. Edward Fox, Secretary. November 11, 1910. $2,500.

***S. W. & B. OIL COMPANY,**
622 Merchants Exchange Bldg., San Francisco, Cal. A. D. King, Vice President. V. B. Fletcher, Secretary. March 23, 1904. $400,000. Five wells, Fresno County.

SWAN OIL COMPANY,
Visalia, Cal. H. Jerusalem, Secretary. January 8, 1900. $15,000.

SYNDICATE OIL COMPANY,
San Luis Obispo, Cal. E. W. Clark, President. P. M. Gregg, Secretary. March 18, 1905. $250,000.

SYNDICATE PETROLEUM COMPANY,
424 W. Thirty-eighth St., New York. N. Y. Care Manhattan Soap Company. Oscar M. Burke, President. E. E. Helyer, Secretary. March 26, 1912. $50,000. Kern County.

***TAMALPAIS OIL COMPANY,**
149 California St., San Francisco, Cal. E. A. Bunker, President. F. F. Bostwick, Secretary. March 31, 1910. $500,000. Three wells, Kern County.

***TANNEHILL OIL COMPANY,**
1815 Cherokee Ave., Hollywood, Cal. L. B. Tannehill, President. C. C. Tannehill, Secretary. February 4, 1909. $250,000. Eleven wells, Kern County.

TAPO OIL COMPANY,
Santa Paula, Cal. S. G. Graham, President. Allan C. McKevitt, Secretary. April 27, 1900. $1,000,000.

TARR & McCOMB,
1025 Central Bldg., Los Angeles, Cal.

TECUMSEH PETROLEUM COMPANY,
Spreckels Bldg., San Diego, Cal. W. H. V. Egan, President. A. J. Razeto, Secretary. February 2, 1918. $225,000.

***TEJON OIL COMPANY,**
P. O. Box 271, Bakersfield, Cal. H. R. Peacock, President. Peter McCart, Secretary. November 9, 1908. $20,000. Six wells, Kern County.

TEMPLE OIL COMPANY,
909 Title Insurance Bldg., Los Angeles, Cal. F. C. van Deinse, President. R. J. Pagen, Secretary. July 30, 1892. $60,000.

THETA OIL AND LAND COMPANY,
260 California St., San Francisco, Cal. Donald Y. Campbell, President. W. C. de Fremery, Secretary. February 20, 1900. $48,380. Kern County.

36 OIL COMPANY,
Room 3, Farmers National Bank Bldg., Fresno, Cal. E. E. Manheim, President. Geo. L. Warlow, Secretary. December 24, 1900. $500,000.

THIRTY THIRTY TWO LAND COMPANY,
1008 Security Bldg., Los Angeles, Cal. J. M. Danziger, President. Geo. L. Reynolds, Secretary. December 8, 1910. $8,500.

32 OIL COMPANY,
911 Investment Bldg., Los Angeles, Cal. W. C. Price, President. W. R. Wheat, Secretary. December 14, 1908. $10,000.

JOHN THOMAS OIL COMPANY,
82 Temple Block, Los Angeles, Cal. H. Clay Needham, President. James H. Blanchard, Secretary. August 6, 1900. $336,000.

THREE TWENTY OIL COMPANY,
907 Wilson St., Fresno, Cal. M. R. Maclary, Vice President. F. G. Story, Secretary. March 23, 1910. $500,000.

TIA JUANA VALLEY OIL COMPANY,
323 Timken Bldg., San Diego, Cal. September 16, 1910. $70,000.

***TIBER PACIFIC OIL COMPANY,**
412 Bumiller Bldg., Los Angeles, Cal. J. M. Roberts, President. A. L. Ellis, Secretary. August 5, 1914. $325,000. Six wells, San Luis Obispo County.

TIDAL WAVE OIL COMPANY,
Care G. W. Glines, 2306 Second St., Selma, Cal. T. B. Matthews, Vice President. G. W. Glines, Secretary. July 22, 1899. $25,000.

TIGER OIL COMPANY,
820 Hearst Bldg., San Francisco, Cal. Frank V. Bell, President. Arthur McNamara, Secretary. January 11, 1918. $10,000.

TIMBER CANYON OIL COMPANY,
Care D. H. Lanbersheimer, 231 Security Bldg., Los Angeles, Cal. August 2, 1918. $100,000. (Formerly Timber Canyon Syndicate.)

TITICACA OIL COMPANY,
617 Merritt Bldg., Los Angeles, Cal. Chester W. Brown, President. F. B. Sutton, Secretary. May 11, 1905. $1,000,000.

TITUS, LOUIS,
Flatiron Bldg., San Francisco, Cal. One well, San Luis Obispo County. (Now being abandoned.)

***TOPAZ OIL COMPANY,**
Box 34, Bakersfield, Cal. A. J. Woody, President. F. A. Young, Secretary. June 25, 1908. $20,000. Two wells, Kern County.

TOP KNOT OIL COMPANY,
421 N. Main St., Santa Ana, Cal. A. D. Bishop, President. A. J. Visel, Secretary. October 5, 1900. $200,000. Kern County. (Dissolved.)

TORREY CAÑON OIL COMPANY,
1232 Merchants Exchange Bldg., San Francisco, Cal. C. B. Wingate, President. G. M. Murphy, Secretary. July 1, 1910. $200,000.

TOWSLEY CAÑON OIL COMPANY,
1122 Investment Bldg., Los Angeles, Cal. J. D. Coplen, President. J. H. Borders, Secretary. July 16, 1915. $25,000.

***TRADERS OIL COMPANY,**
616 Union Oil Bldg., Los Angeles, Cal. M. V. McQuigg, President. A. J. Wallace, Secretary. July 13, 1907. $1,500,000. Twenty-five wells, Fresno County; 27 wells, Kern County.

TRADERS OIL CORPORATION,
616 Union Oil Bldg., Los Angeles, Cal. M. V. McQuigg, President. April 3, 1918. $8,500,000.

***TRAFFIC OIL COMPANY,**
616 Union Oil Bldg., Los Angeles, Cal. M. V. McQuigg, President. A. J. Wallace, Secretary. April 12, 1910. $2,500,000. Sixteen wells, Kern County.

***TREASURE OIL AND REALTY COMPANY,**
Care T. R. Finley, Santa Maria, Cal. Santa Barbara County.

TRES SIERRITAS OIL AND MINING COMPANY,
P. O. Box 505, Lemoore, Cal. John McGlashan, President. Edward P. Ammerman, Secretary. October 21, 1899. $60,000.

TRI-STATE OIL COMPANY,
La Habra, Cal. F. G. Phillips, President. E. B. Coil, Secretary. March 13, 1912. $500,000.

***TROJAN OIL COMPANY,**
401 Union Oil Bldg., Los Angeles, Cal. A. J. Aber, President. B. M. Howe, Secretary. May 19, 1914. $500,000. One well, Kern County.

TRUE OIL COMPANY, THE,
714 Story Bldg., Los Angeles, Cal. D. C. Narver, President. E. E. Prime, Secretary. February 23, 1917. $3,000,000.

TULARE OIL AND MINING COMPANY,
115 N. K St., Tulare, Cal. L. E. Schoenemann, President. C. W. Cobb, Secretary. November 1, 1890. $300,000. Kern County.

***TUMBADOR OIL COMPANY,**
1112 Merchants National Bank Bldg., San Francisco, Cal. W. F. Williamson, President. E. M. Eddy, Secretary. May 5, 1910. $500,000. Thirteen wells, Kern County.

***TUNNEL PETROLEUM COMPANY,**
805 Hollingsworth Bldg., Los Angeles, Cal. F. R. Campbell, President. H. A. Dunn, Secretary. April 28, 1916. $250,000. One well, Ventura County.

TURNER OIL COMPANY (Los Angeles),
Box 144, Arcade Station, Los Angeles, Cal. G. L. Holton, President. Robt. G. Holton, Secretary. June 14, 1899. $150,000.

TURNER OIL COMPANY (San Francisco),
180 Sutter St., San Francisco, Cal. Joseph Seeley, President. J. W. Pauson, Secretary. November 5, 1904. $50,000. Fresno County.

***T. W. COMPANY,**
Box 34, Bakersfield, Cal. T. M. Young, President. G. R. Peckham, Secretary. March 12, 1909. $100,000. Five wells, Kern County.

TWENTIETH CENTURY OIL COMPANY,
1156 J St., Fresno, Cal. C. A. Telfer, Secretary. W. O. Miles, President. October 25, 1900. $200,000.

TWENTY-FOUR OIL COMPANY,
Box 823, Fresno, Cal. Geo. Kaehler, President. A. Buttner, Secretary. December 1, 1909. $24,000.

TWIN CITIES OIL COMPANY,
221 Broad St., Nevada City, Cal. C. E. Clinch, President. D. E. Morgan, Secretary. May 20, 1901. $250,000, Orig.; $10,000 Dec.

UNION ANNEX OIL COMPANY,
1210 Washington Bldg., Los Angeles, Cal. J. S. Torrance, President. February 24, 1903. $1,000,000.

UNION KERN OIL COMPANY,
545 I. W. Hellman Bldg., Los Angeles, Cal. July 30, 1910. $1,000,000.

***UNION OIL COMPANY OF CALIFORNIA,**
Union Oil Bldg., Los Angeles, Cal. W. L. Stewart, President. John McPeak, Secretary. October 17, 1890. $5,000,000, Orig.; $50,000,000 Inc. Twenty-two wells, Fresno County; 34 wells, Kern County; 1 well, Los Angeles County; 80 wells, Orange County; 82 wells, Ventura County; 168 wells, Santa Barbara County.

***UNITED CRUDE OIL COMPANY, THE,**
Drawer "O", Bakersfield, Cal. E. H. Loveland, President. C. H. Burdick, Secretary. August 16, 1908. $500,000. Four wells, Kern County.

UNITED DEVELOPMENT COMPANY,
Box 187, Coalinga, Cal. O. D. Loftus, President. Guy H. Salisbury, Secretary. September 21, 1909. $45,000.

UNITED MIDWAY OIL COMPANY,
Box 337, Visalia, Cal. J. C. Newman, President. C. E. Groat, Secretary. March 5, 1910. $100,000. Kern County.

***UNITED OIL COMPANY, THE,**
1131 Investment Bldg., Los Angeles, Cal. C. F. Whittier, President. K. E. Steinbauer, Secretary. November 19, 1909. $2,000,000. Twelve wells, Kern County.

U. S. OIL AND MINING COMPANY,
Box 246, Bakersfield, Cal. Martin Coyne, President. L. Hirshfeld, Secretary. December 23, 1899. $300,000.

U. S. OIL REFINING AND PRODUCTION COMPANY,
305 Hobart Bldg., San Francisco, Cal. J. C. Kemp van Ee, President. P. F. Unger, Secretary. January 27, 1910. $1,000,000.

***UNITED WESTERN CONSOLIDATED OIL COMPANY,**
Hobart Bldg., San Francisco, Cal. A. G. Wilkes, President. Fred Shingle, Secretary. May 1, 1917. $3,000,000. Sixteen wells, Kern County; 1 well, Santa Barbara County.

UNITED WESTERN OIL COMPANY,
705 Hobart Bldg., San Francisco. John McKeon, President. A. B. Kast, Secretary. April 12, 1916. $500,000.

***UNIVERSAL OIL COMPANY,**
510 Crocker Bldg., San Francisco, Cal. R. N. Bishop, President. R. A. Morton, Secretary. April 27, 1911. $6,000,000. Forty-four wells, Kern County; 3 wells, Fresno County.

VALLEY OIL COMPANY,
Care J. A. Fleutsch, Coalinga, Cal. S. W. Morshead, President. J. A. Fleutsch, Secretary. February 18, 1909. $100,000.

VANCOUVER MIDWAY OIL COMPANY,
310 Sansome St., San Francisco, Cal. A. L. Weil, President. M. Syme, Secretary. January 10, 1911. $100,000. Kern County.

VANDERLIP OIL COMPANY,
114 E Fourth St., Santa Ana, Cal. Geo. A. Edgar, President. H. C. Vanderlip, Secretary. February 16, 1901. $200,000. Kern County.

***VENTURA-PACIFIC OIL COMPANY,**
412 Owl Drug Bldg., San Diego, Cal. F. E. Wisecup, President. E. G. Dehm, Secretary. October 18, 1912. $225,000. Five wells, Ventura County.

VERA CRUZ OIL COMPANY,
1101 Story Bldg., Los Angeles, Cal. Wm. Perry, President. A. F. Clark, Secretary. November 19, 1915. $100,000.

VERATINA OIL COMPANY,
348 Hayes St., San Francisco, Cal. A. W. Craig, Secretary. February 27, 1901. $150,000.

***VESTA OIL COMPANY,**
Room 421, 607 S. Hill St., Los Angeles, Cal. Geo. F. Freeman, President. L. Schenck, Secretary. August 7, 1900. $300,000. Eleven wells, Kern County.

***VICTOR OIL COMPANY,**
1109 I. N. Van Nuys Bldg., Los Angeles, Cal. H. D. Colson, President. Frank C. Winter, Secretary. March 30, 1910. $500,000. Five wells, Kern County.

VICTORIA OIL COMPANY,
1036 Andrews Bldg., Minneapolis, Minn. Charles Murray, President. E. J. Murray, Secretary. November 30, 1914. $50,000.

***VIRGINIA OIL COMPANY,**
Box 655, Los Angeles, Cal. Albert Brown, President. J. B. Kessinger, Secretary. May 26, 1914. $25,000. Thirty wells, Kern County.

***VISALIA MIDWAY OIL COMPANY,**
110 S. Court St., Visalia, Cal. E. L. Smith, President. Geo. D. Smith, Secretary. March 9, 1901. $500,000. Seven wells, Kern County.

VISALIA OIL COMPANY,
626 S. Garden St., Visalia, Cal. Louis Lucier, President. Otto Luhdorff, Secretary. April 13, 1914. $100,000. Kern County.

VISHNU OIL COMPANY,
300 Crocker Bldg., San Francisco, Cal. W. Gregg, Jr., President. W. R. Berry, Secretary. June 20, 1900. $500,000.

***VOLCAN OIL AND REFINING COMPANY,**
First and I Sts., P. O. Box 83, San Diego, Cal. H. N. Goff, President. G. F. Nolan, Secretary. January 24, 1902. $550,000. Seven wells, Kern County.

WABASH OIL COMPANY,
310 Sansome St., San Francisco, Cal. John Barneson, President. W. J. Dinsmore, Secretary. April 14, 1903. $300,000, Orig.; $15,000, Dec.

WALKER OIL COMPANY,
Care J. A. Fluetsch, 305 Fifth St., Coalinga, Cal. O. S. Axtell, Vice President. J. A. Fluetsch, Secretary. November 1, 1909. $300,000.

***W. & S. OIL COMPANY,**
1112 Merchants National Bank Bldg., San Francisco, Cal. W. F. Williamson, President. D. E. Gunn, Secretary. May 11, 1911. $200,000. Three wells, Kern County. (Property leased to the Potter Oil Company of California, September, 1917.)

***WARD OIL COMPANY,**
Room 3, Farmers National Bank Bldg., Fresno, Cal. Geo. L. Warlow, President. Chester H. Warlow, Secretary. November 15, 1907. $100,000. Eight wells, Fresno County.

***WASHINGTON COALINGA OIL COMPANY,**
Care Harry Dalton, 601 Foster Bldg., Denver, Colo. Fresno County.

***WATSONVILLE OIL COMPANY,**
339 Main St., Watsonville, Cal. M. B. Tuttle, President. A. W. Cox, Secretary. December 15, 1896. $100,000, Orig.; $200,000 Inc. Five wells, Santa Clara County.

***WELCH, P.,**
Maricopa, Cal. Two wells, Kern County.

WELCOME OIL COMPANY,
78 Bacon Bldg., Oakland, Cal. J. J. Enos, President. Frank Rogers, Secretary. October 14, 1909. $200,000.

***WESCO PETROLEUM COMPANY,**
502 Merritt Bldg., Los Angeles, Cal. D. J. Gouyer, President. Five wells, Kern County.

WEST AMERICAN OIL COMPANY,
Care S. W. Waterhouse, 474 N. First St., San Jose, Cal. S. W. Waterhouse, President. Annie C. Waterhouse, Secretary. September 2, 1914. $25,000. (Dissolved.)

***WEST COAST OIL COMPANY,**
55 New Montgomery St., San Francisco, Cal. Wm. Sproule, President. P. G. Williams, Secretary. June 23, 1908. $5,000,000. Ten wells, Los Angeles County; 51 wells, Orange County.

WESTERN MINERALS COMPANY,
704 West Coast Life Bldg., 354 Pine St., San Francisco, Cal. H. L. Tevis, President. F. G. Drum, Secretary. December 14, 1899. $100,000.

WESTERN OIL AND GAS COMPANY, LTD.,
511 Hutton Bldg., Spokane, Wash. John M. Downs, President. L. M. Weaver, Secretary. February 14, 1917. $150,000.

WESTERN OIL COMPANY,
2479 East Ninth St., Los Angeles, Cal. F. P. W. Hill, President. G. Zeeman, Secretary. April 15, 1912. $10,000.

***WESTERN UNION OIL COMPANY,**
Southern California Savings Bank Bldg., 4th and Spring Sts., Los Angeles. A. H. Braly, President. Morris Albee, Secretary. April 19, 1900. $1,000,000. Forty wells, Santa Barbara County.

***WEST PENN COMPANY, INC., THE,**
Brower Bldg., Bakersfield, Cal. F. L. Bartlett, President. F. L. Stowell, Secretary. (Dissolved.) (Property now operated by Potter Oil Co. of Cal.)

***WESTSIDE OIL COMPANY,**
608 Grosse Bldg., Los Angeles, Cal. M. A. Robinson, President. Lester L. Robinson, Secretary. December 7, 1908. $100,000. Three wells, Kern County.

WEST SLOPE OIL COMPANY,
300 E Main St., Visalia, Cal. C. J. Giddings, President. J. Sub Johnson, Secretary. June 1, 1911. $1,000,000.

WEST STATES PETROLEUM COMPANY,
Hobart Bldg., San Francisco, Cal. April 17, 1917. $1,000,000. (Property sold to United Western Consolidated Oil Company.)

WHITE ROCK PETROLEUM COMPANY,
1386 Seventh Ave., San Francisco, Cal. W. I. Sterett, President. A. A. Cohn, Secretary. November 18, 1911. $300,000.

***WHITE STAR OIL COMPANY,**
510 Trust & Savings Bldg., Los Angeles, Cal. Richard Arenz, President. Chas. E. Putnam, Secretary. February 8, 1909. $1,000,000. Seven wells, Ventura County.

WHITLEY, C. W.,
825 Security Bldg., Los Angeles, Cal. One well, Los Angeles County.

WHITTIER CONSOLIDATED OIL COMPANY,
1004 Security Bldg., Los Angeles, Cal. T. A. O'Donnell, President. Ellis T. Yarnell, Secretary. June 7, 1900. $1,000,000.

***WHITTIER CRUDE OIL COMPANY,**
200 S. Los Angeles St., Los Angeles, Cal. L. D. Sale, President. H. G. A. Lovell, Secretary. January 22, 1900. $300,000. Seven wells, Los Angeles County.

WHITTIER OIL AND DEVELOPMENT COMPANY,
104 W. Philadelphia St., Whittier, Cal. C. W. Clayton, President. S. W. Barton, Secretary. May 31, 1900. $250,000.

***WILBERT OIL COMPANY, THE,**
1704 Nineteenth St., Bakersfield, Cal. H. A. Jastro, President. F. G. Munzer, Secretary. September 18, 1907. $125,000. Eight wells, Kern County.

WILCOX OIL COMPANY,
9 Main St., San Francisco, Cal. Chas. G. Wilcox, President. A. N. Baldwin, Secretary. February 21, 1911. $1,000,000.

WILKES HEAD OIL COMPANY,
705 Hobart Bldg., San Francisco, Cal. Thomas Wilkes, President. A. B. Kast, Secretary. November 2, 1913. $300,000.

***H. S. WILLIAMS OIL COMPANY,**
112 Market St., San Francisco, Cal. H. S. Williams, President. John Lee, Jr., Secretary. March 30, 1916. $25,000. Five wells, Kern County. (Dissolved.) (Property taken over by Pacific Crude Oil Company.)

WILLIAMS, H. S.
112 Market St., San Francisco, Cal.

WILSHIRE OIL COMPANY,
Twenty-seventh St. and Santa Fe Ave., Los Angeles, Cal. George S. Machris, President. Victor A. Machris, Secretary. August 30, 1917. $250,000.

W. J. OIL COMPANY,
Care E. F. Coons Bakersfield, Cal. S. P. Wible, President. Edith F. Coons, Secretary. October 23, 1908. $25,000. Kern County.

W. K. OIL COMPANY,
180 Sutter St., San Francisco, Cal. John Hinkel, President. J. W. Pauson, Secretary. December 8, 1904. $25,000. Fresno County.

***W. M. AND M. OIL COMPANY, THE,**
Box 501, Fresno, Cal. M. L. Woy, President. D. C. Sample, Secretary. November 17, 1909. $100,000. Four wells, Fresno County.

***W. T. & M. COMPANY,**
Box 34, Bakersfield, Cal. T. M. Young, President. G. R. Peckham, Secretary. April 19, 1909. $500,000. Six wells, Kern County.

WYOMING CONSOLIDATED OIL COMPANY,
620 N. Marengo Ave., Pasadena, Cal. C. W. Leighton, President. A. L. Twombly, Secretary. July 18, 1912. $3,000,000.

YELLOW CREEK EXPLORATION COMPANY,
Merchants National Bank Bldg., San Francisco, Cal. A. J. McNear, President. W. F. Williamson, Secretary. November 22, 1917. $25,000.

***YELLOWSTONE OIL COMPANY,**
711 Merchants National Bank Bldg., Los Angeles, Cal. J. H. Collier, President. Ira L. Vance, Secretary. July 10, 1907. $1,000,000. Kern County.

YORBA OIL COMPANY,
1004 Title Insurance Bldg., Los Angeles, Cal. C. L. Wallis, President. J. E. Wallis, Secretary. May 29, 1914. $75,000.

***YORK COALINGA OIL COMPANY,**
607 First National Bank Bldg., San Francisco, Cal. Robert Hays Smith, President. F. M. Bortner, Secretary. April 30, 1902. $300,000. Fresno County.

YOSEMITE OIL COMPANY,
414 Oakland Bank Bldg., Oakland, Cal. W. E. Beck, President. E. O. Hotchkiss, Secretary. October 7, 1899. $200,000, Orig.; $10,000, Dec.

***ZENITH OIL COMPANY,**
428-9 I. W. Hellman Bldg., Los Angeles, Cal. Edward Strasburg, President. A. F. Schiffman, Secretary. April 20, 1900. $30,000. One well, Los Angeles County.

***ZIER OIL COMPANY,**
1002 Crocker Bldg., San Francisco, Cal. Wm. McQuire, President. C. H. Holbrook, Jr., Secretary. April 5, 1905. $100,000. Eighteen wells, Fresno County.

APPENDIX.

PUBLICATIONS OF THE CALIFORNIA STATE MINING BUREAU.

Publications of this Bureau will be sent on receipt of the requisite amount. Only stamps, coin or money orders will be accepted in payment.

Money orders should be made payable to the STATE MINING BUREAU.

Personal checks will not be accepted.

REPORTS.

Asterisk (*) indicates the publication is out of print.

	Price
*Report I. Henry G. Hanks. 1880.	
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*Report III. Henry G. Hanks. 1883.	
*Report IV. Henry G. Hanks. 1884.	
*Report V. Henry G. Hanks. 1885.	
*Report VI. Part 1. Henry G. Hanks. 1886.	
*Report VI. Part 2. Wm. Irelan, Jr. 1886.	
*Report VII. Wm. Irelan, Jr. 1887.	
*Report VIII. Wm. Irelan, Jr. 1888.	
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*Report X. Wm. Irelan, Jr. 1890.	
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*Report XIII. J. J. Crawford, 1896. (Third biennial)	----
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Mines and Mineral Resources of Imperial and San Diego Counties—F. J. H. Merrill. 1914	.35
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Mines and Mineral Resources, Del Norte, Humboldt and Mendocino Counties—F. L. Lowell. 1915	.25
Mines and Mineral Resources, Fresno, Kern, Kings, Madera, Mariposa, Merced, San Joaquin and Stanislaus Counties—Walter W. Bradley, G. C. Brown, F. L. Lowell and R. P. McLaughlin, 1915	.50
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Report XIV. Fletcher Hamilton, 1915, Biennial period 1913–1914. (The above county chapters combined in a single volume)	2.00
Chapters of State Mineralogist's Report, Biennial Period, 1915–1916, Fletcher Hamilton:	
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Same as above, without geological map	.65
Mines and Mineral Resources, Butte, Lassen, Modoc, Sutter and Tehama Counties—W. Burling Tucker, Clarence A. Waring. 1917	.50
Mines and Mineral Resources, El Dorado, Placer, Sacramento and Yuba Counties—W. Burling Tucker, Clarence A. Waring. 1917	.65
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Mines and Mineral Resources, Monterey, San Benito, San Luis Obispo, Santa Barbara and Ventura Counties—Walter W. Bradley, Emile Huguenin, C. A. Logan, Clarence A. Waring. 1917	.65
Mines and Mineral Resources, San Bernardino and Tulare Counties—H. C. Cloudman, Emile Huguenin, F. J. H. Merrill, W. Burling Tucker. 1917	.65
Report XV. Fletcher Hamilton, 1918, Biennial period, 1915–1916. (The above county chapters combined in a single volume)	(In press)

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*Bulletin 47.	Mineral Production of California, by Counties, 1906.—Chas. G. Yale. (Tabulated sheet)	----
*Bulletin 48.	Mineral Production of California for Twenty Years.—Chas. G. Yale. 1906. (Tabulated sheet)	----
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*Bulletin 55.	Mineral Production of California for Twenty-two Years.—D. H.	
*Bulletin 56.	Mineral Production for 1908, County Maps, and Mining Laws of California.—D. H. Walker. 1909. (Statistical)	----
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*Bulletin 72.	Geologic Formations of California.—James Perrin Smith. 1917 (For Map, see below)	.25
*Bulletin 73.	Report of Operations of Department of Petroleum and Gas for 1915-1916.—R. P. McLaughlin. 1917	----
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Bulletin 76.	Manganese and Chromium in California.—Walter W. Bradley, Emile Huguenin, C. A. Logan, W. Burling Tucker, C. A. Waring, 1918. (In press)	‡
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Bulletin 82.	Second Annual Report of the State Oil and Gas Supervisor, 1916–1917.—R. P. McLaughlin. 1918	----
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Preliminary Reports.

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Tuolumne County	.25
Geological Map of California (mounted)—50x60 inches	2.50

OIL FIELD MAPS.

	Price
Belridge Oil Field and McKittrick Front Oil Field	$0.50
Coalinga Oil Field	.65
Devil's Den Oil Field	.50
Kern River Oil Field	.50
Lost Hills Oil Field and North Belridge Oil Field	.50
Midway Oil Field, including Buena Vista Hills	.50
North Midway Oil Field and McKittrick Oil Field	.50
Salt Lake Field, Los Angeles County	.50
Santa Maria Oil Field, including Casmalia and Lompoc	.50
Santa Maria Oil Field, including Cat Canyon and Los Alamos	.50
Sargent Oil Field, Santa Clara County	.25
Sunset Oil Field and region to the South, including San Emidio	.50
Whittier-Fullerton Oil Field, including Olinda, Brea Cañon, Puente Hills, East Coyote and Richfield	.50
Whittier-Fullerton Oil Field, including Whittier, West Coyote and Montebello	.50

DETERMINATION OF MINERAL SAMPLES.

Samples (limited to three at one time) of any mineral found in the state may be sent to the Bureau for identification, and the same will be classified free of charge. No samples will be determined if received from points outside the state. It must be understood that no assays or quantitative determinations will be made. Samples should be in lump form if possible, and marked plainly with name of sender on outside of package, etc. No samples will be received unless delivery charges are prepaid. A letter should accompany sample, giving locality where mineral was found and the nature of the information desired.

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FOR THE

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BIENNIAL REPORT, 1916-1918—LETTER OF TRANSMITTAL AND EDUCATIONAL DIRECTORY.

By EDWARD HYATT, Superintendent of Public Instruction.

LETTER OF TRANSMITTAL.

To His Excellency, William D. Stephens,
Governor of California,
and the State Board of Education.

Ladies and Gentlemen: Please find herewith the reports prescribed by law for the educational affairs entrusted to my general supervision during the past biennium. I hope the various tabulations and the accompanying descriptive text may afford a clear view of the conditions in the state department of education during that period.

I remain, very respectfully,

Your obedient servant,

Edward Hyatt,
Superintendent of Public Instruction.

September 15, 1918.

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EDUCATIONAL DIRECTORY

Superintendent of Public Instruction.

(Elected November 3, 1914.)

Name of member	Term expires	Address
Edward Hyatt	January, 1919	Riverside.

Employees of the Superintendent of Public Instruction.

Mrs. M. G. Hyatt, Deputy	Riverside
Job Wood, Jr., Statistician	Salinas
Mona Raine Schroeder, Assistant Statistician	Sacramento
W. S. Dyas, Bookkeeper	Sacramento
F. B. Fitch, Assistant Bookkeeper	Los Angeles
P. C. Gaskill, Clerk and Stenographer	Vallejo

STATE BOARD OF EDUCATION.

(Appointed by the Governor.)

Name of member	Term expires	Address
E. P. Clarke	August, 1918	Riverside.
Mrs. O. Shepard Barnum	August, 1921	312 S. Fifth st., Alhambra.
Mrs. Agnes Ray	August, 1920	272 Twenty-third st., Oakland.
George W. Stone	August, 1920	143 High st., Santa Cruz.
Charles A. Whitmore	August, 1919	Visalia.

NOTE.—Edward Hyatt, Superintendent of Public Instruction, is Secretary of the Board, according to law. Two vacancies exist, caused by resignations of T. S. Montgomery, San Jose, and Marshall DeMotte, Corning.

Assistant Superintendents of Public Instruction or Commissioners of Education.

(Appointed by State Board of Education. Took office January 1, 1914.)

Margaret S. McNaught, Commissioner of Elementary Schools	San Jose
Will C. Wood, Commissioner of Secondary Schools	Alameda
Edwin R. Snyder, Commissioner of Vocational Education	Santa Barbara

State Supervisors.

Clark W. Hetherington, Physical Education	Sacramento
J. B. Lillard, Agricultural Instruction (Under Vocational Education Law.)	Los Angeles
Maude I. Murchie, Teacher Training in Home Economics (Under Vocational Education Law.)	San Jose
J. C. Beswick, Director of Vocational War Work	Los Angeles

Employees of State Board of Education.

Miss Winifred Van Hagen, Assistant State Supervisor of Physical Education	Oakland
C. S. Pixley, Chief Clerk	Sacramento
Miss Sophia H. Levy, Secretary to Commission of Credentials	Berkeley
Mrs. Florence B. Argall, Stenographer	Sacramento
Miss Marion H. Ketcham, Clerk	Sacramento
Henry M. Lynn, Bookkeeper	Sacramento
Mrs. Abbie T. Pixley, Stenographer	Sacramento
Mrs. Marion G. Burgess, Stenographer	Sacramento
Miss Gertrude Tonzi, Stenographer	Sacramento
Mrs. Edna Gaskill, Stenographer	Sacramento
Miss S. Verna Lynn, Stenographer	Sacramento
Mrs. Eva Darwin, Stenographer	Sacramento
Miss M. Gertrude Meade, Stenographer	Sacramento
Miss Julia Baker, Clerk	Dixon
V. L. Assalena, Mailing Clerk	Sacramento
Wyman L. Pease, Clerk	Sacramento

COUNTY SUPERINTENDENT OF SCHOOLS

County	Name and address	
Alameda	Geo. W. Frick	Oakland
Alpine	Mrs. Eugenia M. Bruns	Sheridan, Nev.
Amador	Mrs. Sabra R. Greenhalgh	Jackson
Butte	Mrs. Pearle Rutherford	Oroville
Calaveras	Teresa Rivara	San Andreas
Colusa	Perle Sanderson	Colusa
Contra Costa	Wm. H. Hanlon	Martinez
Del Norte	Jos. M. Hamilton	Crescent City
El Dorado	S. B. Wilson	Placerville
Fresno	E. W. Lindsay	Fresno
Glenn	S. M. Chaney	Willows
Humboldt	Geo. Underwood	Eureka
Imperial	A. P. Shibley	El Centro
Inyo	Mrs. M. A. Clarke	Bishop
Kern	L. E. Chenoweth	Bakersfield
Kings	J. E. Meadows	Hanford
Lake	Minerva Ferguson	Lakeport
Lassen	Mrs. Julia A. Norwood	Susanville
Los Angeles	Mark Keppel	Los Angeles
Madera	Craig Cunningham	Madera
Marin	Jas. B. Davidson	San Rafael
Mariposa	John L. Dexter	Mariposa
Mendocino	Mrs. Anna Porterfield	Ukiah
Merced	Margaret Sheehy	Merced
Modoc	Mrs. Nettie B. Harris	Alturas
Mono	Mrs. A. M. Hays	Bridgeport
Monterey	Geo. Schultzberg	Salinas
Napa	Lena A. Jackson	Napa
Nevada	R. J. Fitzgerald	Nevada City
Orange	R. P. Mitchell	Santa Ana
Placer	Irene Burns	Auburn
Plumas	Mrs. Kate L. Donnelley	Quincy
Riverside	Raymond Cree	Riverside
Sacramento	Carolyne M. Webb	Sacramento
San Benito	W. J. Cagney	Hollister
San Bernardino	Mrs. Grace C. Stanley	San Bernardino
San Diego	John F. West	San Diego
San Francisco	Alfred Roncovieri	San Francisco
San Joaquin	John W. Anderson	Stockton
San Luis Obispo	W. S. Wight	San Luis Obispo
San Mateo	Roy W. Cloud	Redwood City
Santa Barbara	Mamie V. Lehner	Santa Barbara
Santa Clara	D. T. Bateman	San Jose
Santa Cruz	Champ S. Price	Santa Cruz
Shasta	Mrs. Charlotte Cunningham	Redding
Sierra	Belle Alexander	Downieville
Siskiyou	W. H. Parker	Yreka
Solano	Dan H. White	Fairfield
Sonoma	Mrs. Florence Barnes Schieffer	Santa Rosa
Stanislaus	Frank Bacon	Modesto
Sutter	Lizzie Vagedes	Yuba City
Tehama	Mamie B. Lang	Red Bluff
Trinity	Maude I. Schroter	Weaverville
Tulare	J. E. Buckman	Visalia
Tuolumne	G. P. Morgan	Sonora
Ventura	Jas. E. Reynolds	Ventura
Yolo	Harriett S. Lee	Woodland
Yuba	Jennie Malaley	Marysville

County Superintendents are Secretaries of their respective County Boards of Education.

CITY SUPERINTENDENT OF SCHOOLS

City	County and name of superintendent	
Alameda	Alameda	C. J. Du Four
Alhambra	Los Angeles	Charles Emory Barber
Bakersfield	Kern	D. W. Nelson
Berkeley	Alameda	M. C. James
Chico	Butte	Chas. H. Camper
Eureka	Humboldt	Geo. B. Albee
Fresno	Fresno	Jerome O. Cross
Long Beach	Los Angeles	W. L. Stephens
Los Angeles	Los Angeles	Albert Shiels
Marysville	Yuba	Jennie Malaley
Modesto	Stanislaus	W. E. Faught
Oakland	Alameda	Fred M. Hunter
Oroville	Butte	H. P. Short
Palo Alto	Santa Clara	Walter H. Nichols
Pasadena	Los Angeles	Jeremiah M. Rhodes
Petaluma	Sonoma	E. B. Dykes
Pomona	Los Angeles	G. Vernon Bennett
Richmond	Contra Costa	W. T. Helms
Riverside	Riverside	A. N. Wheelock
Sacramento	Sacramento	Chas. C. Hughes
Salinas	Monterey	L. E. Kilkenny
San Bernardino	San Bernardino	Roy B. Stover
San Diego	San Diego	Duncan MacKinnon
San Jose	Santa Clara	Alex Sherriffs
San Luis Obispo	San Luis Obispo	Arthur H. Mabley
San Rafael	Marin	Roger S. Phelps
Santa Ana	Orange	John A. Cranston
Santa Barbara	Santa Barbara	Albert C. Olney
Santa Cruz	Santa Cruz	John W. Linscott
Santa Monica	Los Angeles	Horace M. Rebok
Santa Rosa	Sonoma	T. F. Brownscombe
Stockton	San Joaquin	Ansel S. Williams
Vallejo	Solano	G. V. Whaley
Ventura	Ventura	Arthur L. Vincent

GENERALIZATIONS.

By Job Wood, Jr., *Statistician.*

THE STATE SHOULD GIVE GREATER SUPPORT TO THE ELEMENTARY SCHOOLS.

From the table (B) following it will be noted that the state apportionment to elementary schools has increased 45.5 per cent in the last twelve years, while the county's support has increased 145 per cent and the district's support has increased 511 per cent. In other words, the increased cost of education has been rapidly shifting from the state to the county and the district. In the larger centers the big cities are interested in low county tax rates for the reason that county funds are distributed to all districts in the county. Because of this the cities are willing to have a heavy district tax and a lower county rate.

Education a National and State Function.

We more and more see as the great demand for human energy presses upon us that the education of the child is not a matter for the family or district, or even the county, but that it is a nation-wide problem. The family, in most instances, has about all it can do to feed and clothe the children and to spare their services while the county, state and nation train them. After these children are trained they are not the property of the family, but belong apparently exclusively to the government, as the draft of both men and women in this great war has shown.

This being the case the nation and the state should support more liberally the real training school of the American citizen—the elementary school. In the years gone by when education and practical training were left more to the family, it was not so expensive; but now the schools have been called upon to train in manual arts, in domestic science, in government, and for every walk of life. To do this the schools must have trained teachers. Much time beyond the high school must be given to the training of teachers for this difficult task. The state furnishes free training through the normal schools and the university, but expenses for living, for books, and for various supplies fall heavily upon the students. These expenses reach an average of $500 per year. The time of these students per month should be worth at least $50 with the present demand for work. When the student is out $500 in hard cash and $600 in labor, or even $500 in labor, making for the year a total of $1,000, while he is getting his training, we can not expect him to follow the teaching profession when the salaries are much below those of the common laborer who requires little training beyond a grammar school.

The laborer works the year around while the teacher averages about eight and a half months and must live and meet expenses for twelve months. Changing from teaching to some other business for the purpose of supporting himself or his family while he is not teaching is not an easy task.

The following table (A) will show the average annual amounts paid teachers in the elementary schools for the years 1907 and 1918. They will show also the average gain in salaries during that time. It will be noted in large counties where there are many principals, such as Alameda, Fresno, Los Angeles, Sacramento, etc., that salaries have increased very materially. This is for the reason that the large salaries of principals and teachers in large cities and towns are averaged with the salaries of the teachers of the rural districts. The counties of Calaveras, El Dorado, Lake, Lassen, Madera, Mariposa, Mendocino, Napa, Nevada, San Benito, Santa Barbara, Shasta, Sierra, Siskiyou, Trinity, and Tuolumne will show a very slight increase in the average amount of salary paid annually. This is for the reason that there are few principals but many one-teacher schools. Even in a large city such as San Francisco where living has more than doubled, the increase for the average salary has been $107.98 in twelve years.

Actual Salaries Paid Rural Teachers.

In order to show the actual amount of money received during the year closing June 30, 1918, by teachers in rural or one-teacher schools in the several counties, four districts were selected from the counties given below and the actual amounts of money paid teachers as reported by the county superintendent of schools is given. These have been selected at random and they are not the lowest amounts paid, but they are a sample of salaries paid in the one-teacher schools in these counties.

Name of county	Number of teachers		Actual salary paid	
	Men	Women	Men	Women
Butte	1	3	$722 50	$560, $525, $560
Colusa	--------	4	----------	$600, $520, $640, $600
El Dorado	1	3	455 00	$560, $522, $560
Humboldt	1	3	600 00	$560, $515, $585
Kern	--------	4	----------	$600, $600, $490, $600
Lake	--------	4	----------	$560, $487.50, $520, $560
Lassen	--------	4	----------	$600, $560, $610, $560
Madera	1	3	560 00	$600, $660, $640
Mariposa	1	3	924 00	$525, $600, $562
Mendocino	--------	4	----------	$560, $520, $520, $600
Monterey	--------	4	----------	$630, $595, $600, $580
Nevada	--------	3	----------	$560, $560, $560
Placer	1	3	855 00	$560, $480, $490
Plumas	1	3	810 00	$640, $520, $560
San Benito	--------	4	----------	$520, $520, $560, $420
San Bernardino	--------	3	----------	$630, $560, $520
San Luis Obispo	--------	3	----------	$590, $560, $675
Shasta	1	3	600 00	$560, $450, $560
Sierra	--------	4	----------	$560, $600, $600, $600
Siskiyou	--------	4	----------	$550, $600, $525, $450
Tehama	1	3	765 00	$560, $560, $575
Trinity	--------	4	----------	$525, $480, $560, $600
Tuolumne	1	3	765 00	$560, $560, $560
Yuba	--------	4	----------	$640, $560, $480, $560

One need not be much of a mathematician to see that when expensive stage rides and often long railroad trips must be taken that these interior rural schools can secure and hold very few trained teachers. These positions are usually held by young teachers who wish to get experience, or by older teachers who can not fill positions in larger communities. If the young energetic teacher could be held in the district by offering her a sufficient salary she would soon be able to do the work demanded by the community. But, unfortunately, the rural schools are the training schools for the larger centers and there is a constant coming and going of these inexperienced teachers.

Special Taxes on the Community Will Not Meet the Demand.

The district tax will not suffice for meeting the demands for trained teachers. In many mountain communities the valuation of property is so low that the tax limit allowed by law for special taxes would not produce $100 per year.

For several years we have heard the call "back to the farm" as the only remedy for the accumulation of population in the large cities. War-time salaries for labor in connection with shipbuilding, etc., has called from the country large numbers of people who are flooding the central schools with their children. Again, families who are out on the farm in the school district that can maintain school but for seven and a half or eight months with a constant change of inexperienced teachers soon discover that if the children are to have the best educational conditions they must move toward the centers. The farm is abandoned or leased and homes are established in the cities. There is no surer way to build up the city and deplete the country and its population than to have long terms of school with trained teachers in the city and short terms with inexperienced teachers and low salaries in the country. The district taxes and even the county taxes can not remedy this removal to the city. The schools will greatly aid in attracting people to the country if satisfactory school conditions prevail. Since the repeal of the poll tax there has been a constant falling off in the apportionment of school money on the average daily attendance basis. The state gives out on teacher basis $250 per teacher, and apportions the remaining money in the State School Fund on the average daily attendance for the previous year. The following rates per pupil on average daily attendance will be noted:

1910	$10 16	1915	$8 23
1911	10 15	1916	8 21
1912	9 52	1917	8 12
1913	9 08	1918	8 23
1914	9 06		

It will be noticed that there is an increase of 11 cents for 1918 over that of 1917. The reason is that there was $21,689.51 transferred from estates escheated to the State School Fund. This may not happen again for some time, and the rate for the coming year will, more than likely, drop off from 10 cents to 20 cents per pupil per year.

Rate Per Pupil on Enrollment.

The amounts of money given by the state, by the county, and by the district for 1918 and 1907, when divided by the number of pupils enrolled give the following results:

Receipts for pupil on enrollment from *state*----1907, $13.41; 1918, $13.18. Loss, $0.37
Receipts for pupil on enrollment from *county*--1907, 9.47; 1918, 15.68. Gain, 6.21
Receipts for pupil on enrollment from *district*--1907, 3.09; 1918, 12.77. Gain, 9.68

This result is obtained not by any legal provision, as there is no law that apportions money on enrollment, but simply by dividing the receipts from the state and county and district by the enrollment for these years. This will show plainly that the state is not keeping pace with the county and district in the support of the elementary schools. The following tables are submitted for the consideration of those who are interested.

High Schools Show Great Increase.

It will be noted that there has been a great increase in the enrollment in high schools during this period, the number of schools increased from 179 to 311 and the teachers from 1,189 to 4,811, or 3,622 (305 per cent); enrollment of pupils from 27,578 to 126,915, or a gain of 99,337 (362 per cent); the receipts increased from $3,756,655.46 to $13,847,614.44, or a gain of $10,090,958.98 (269 per cent). When the total receipts are divided by the total enrollment of 1907 we have $136.22 per pupil while in 1918 it gives $104.82 per pupil or a falling off on receipts of $31.40 per pupil. This is a most excellent showing as it indicates plainly that the greater the number of pupils the less the cost per individual. The total expenditures for the high school has gained from $2,529,680.79 to $11,432,328.35, or a gain of $8,902,647.56. This makes the cost per pupil enrolled in 1918 $73.89, while in 1907 it was $65.01, or a gain of $8.88. The valuation of property has risen from $5,626,200 in 1907 to $29,703,443 in 1918, or a gain of 428 per cent.

TABLE A.

Comparison of the Number of Teachers Employed in the Elementary Schools for the Years 1918 and 1907 and the Gains and Losses; and the Average Salary Paid for 1918 and 1907 with the Gains.

	Number teachers employed		Gains or losses		Annually paid teachers		Gains
	1918	1907			1918	1907	
Alameda	1,275	682	593		$1,183 50	$854 95	$328 55
Alpine	2	3		—1	700 00	560 00	140 00
Amador	63	61	2		701 63	553 96	147 67
Butte	161	126	35		768 55	635 40	133 15
Calaveras	64	67		—3	677 12	583 62	93 50
Colusa	56	50	6		763 80	639 98	123 82
Contra Costa	248	106	142		982 98	681 39	301 59
Del Norte	22	19	3		722 86	580 84	142 02
El Dorado	59	65		—6	561 00	514 55	46 45
Fresno	594	297	297		971 36	695 04	276 32
Glenn	73	44	29		754 28	634 37	119 91
Humboldt	208	172	36		828 60	685 54	143 06
Imperial	195	--------	195		748 70	------------	----------
Inyo	38	21	17		743 30	603 20	140 10
Kern	280	112	168		867 68	672 86	194 82
Kings	115	57	58		835 17	700 03	135 14
Lake	45	47		—2	582 31	570 57	11 74
Lassen	57	35	22		694 61	596 07	98 54
Los Angeles	3,208	1,454	1,754		1,065 84	762 07	303 77
Madera	87	45	42		747 07	669 59	77 48
Marin	116	83	33		999 10	672 56	326 54
Mariposa	33	29	4		610 73	589 61	21 12
Mendocino	165	153	12		655 68	558 99	96 69
Merced	136	77	59		763 60	637 77	125 83
Modoc	57	40	17		692 97	465 76	227 21
Mono	12	13		—1	798 33	665 18	133 15
Monterey	151	131	20		806 03	625 58	180 45
Napa	88	79	9		693 48	631 23	62 25
Nevada	78	79		—1	748 07	654 79	93 28
Orange	297	151	146		801 13	691 56	109 57
Placer	98	80	18		757 48	614 64	142 84
Plumas	37	29	8		706 23	553 98	152 25
Riverside	249	138	111		815 58	591 01	224 57
Sacramento	427	210	217		1,074 60	773 80	300 80
San Benito	50	49	1		720 22	621 38	98 84
San Bernardino	373	207	166		837 00	613 26	223 74
San Diego	451	232	219		923 67	662 62	261 05
San Francisco	1,464	814	650		1,099 47	991 49	107 98
San Joaquin	326	180	146		915 89	752 84	163 05
San Luis Obispo	146	127	19		744 17	621 35	122 82
San Mateo	169	75	94		968 95	660 96	307 99
Santa Barbara	173	120	53		796 27	709 43	86 84
Santa Clara	404	304	100		914 81	722 96	191 85
Santa Cruz	150	119	31		819 37	634 45	184 92
Shasta	129	125	4		642 69	562 11	80 58
Sierra	21	23		—2	707 68	661 34	46 34
Siskiyou	132	104	28		689 09	609 25	79 84
Solano	129	115	14		920 38	678 17	242 21
Sonoma	286	230	56		811 73	641 25	170 48
Stanislaus	213	89	124		847 43	638 72	208 71
Sutter	55	40	15		836 23	650 13	186 10
Tehama	103	79	24		678 21	570 77	107 44
Trinity	29	25	4		601 55	555 47	46 08
Tulare	303	163	140		834 20	631 72	202 48
Tuolumne	54	54	----------	----------	711 47	642 41	69 06
Ventura	145	89	56		830 69	712 52	118 17
Yolo	87	78	9		778 29	623 11	155 18
Yuba	63	50	13		749 03	602 29	146 74
Totals	14,249	8,246	6,019	—16	*$946 34	*$720 48	*$225 86

—Loss. *Average.

NOTE.—It will be noted that Imperial County did not exist in 1907, but was counted as part of San Diego.

TABLE B.

COMPARISON OF SCHOOL STATISTICS OF 1918 WITH THOSE OF 1907.

Public School Statistics for 1918 in Comparison With Those for 1907 and the Gain or Loss, and in Most Statements the Gain or Loss Per Cent.

Kindergarten Schools.

Subject	1918	1907	Gain or loss	Gain or loss per cent
Teachers employed	672	171	501	281+
Certificates held by teachers—				
Kindergarten, primary	621	114	507	445
Special kindergarten	51	57	*6	*11—
Pupils enrolled—				
Boys	13,251	2,708	10,543	389
Girls	14,099	2,759	11,340	411
Total pupils enrolled	27,350	5,467	21,883	400
Average attendance	14,311	2,823	11,488	407
Average number days schools were open	173	180	*13	*7
Average annual salary paid teachers	$844 92	$566 52	$278 40	49

*Loss.

Kindergarten Schools—Continued.

FINANCIAL.

Subject	1918	1907	Gain or loss	Gain or per cent loss
Total receipts	$902,227 19	$112,074 96	$790,152 23	752
Expenditures for—				
Teachers' salaries	$567,791 19	$96,874 95	$470,916 24	486
Contingent expenses	187,522 21	11,448 22	176,073 99	1,538
Buildings, etc.	26,657 58	1,054 57	25,603 01	2,427
Books	515 05	----------	515 05	----------
Apparatus	1,412 60	----------	1,412 60	----------
Total expenditures	$783,898 63	$109,377 74	$674,520 89	617
Paid per *pupil enrolled* for—				
Teachers salaries	$20 83	$17 72	$3 11	----------
Supplies, etc.	6 85	2 09	4 66	----------
All purposes, excepting buildings	27 68	17 91	9 77	----------
Valuation of all property	204,557 00	57,145 00	147,412 00	258

Elementary Schools.

Subject	1918	1907	Gain or loss	Gain or loss per cent
Active districts	3,453	3,203	250	7.7
Teachers employed—				
Men	1,112	855	257	30
Women	13,137	7,500	5,637	75
Total teachers employed	14,249	8,355	5,894	70
Certificates held by teachers—				
High school	544	446	98	22
Elementary	12,867	7,578	5,289	68
Primary	70	191	*121	*63
Special	768	140	628	448
Average number of days schools were open	164	171	*7	*4+
Enrollment of pupils—				
Boys	232,108	157,676	74,432	47
Girls	216,377	144,924	71,453	49
Total enrollment of pupils	448,485	302,600	145,885	48
Enrolled per teacher	31.4	36.2	*4.8	*13

*Loss.

Elementary Schools—Continued.

FINANCIAL.

Subject	1918	1907	Gain or loss	Gain or loss per cent
Received from—				
Balance on hand	$3,592,181 15	$2,787,421 14	$804,760 01	29
State apportionment	5,913,116 02	4,059,429 04	1,853,686 98	45.5
County funds	7,035,578 75	2,866,479 07	4,169,099 68	145+
District taxes	5,729,426 51	937,001 14	4,792,425 37	511+
Sale of bonds	693,630 86	1,374,395 58	*680,764 72	*49+
Miscellaneous	1,062,757 85	163,618 31	899,139 54	549+
Total receipts	$24,026,691 14	$12,188,344 28	$11,838,346 86	97+
Received on enrollment per pupil from—				
Balance on hand	$8 01	$9 21	*$1 20	----------
State apportionment	13 18	13 41	*37	----------
County apportionments	15 68	9 47	6 21	----------
District funds	12 77	3 09	9 68	----------
Miscellaneous sources	2 37	54	1 83	----------
Total receipts (less cost of buildings) per pupil	$52 02	$35 73	$16 29	45+
Expended for—				
Salary of teachers	$13,484,445 77	$5,943,075 78	$7,541,369 99	126.9
Current expenses	3,744,328 20	1,565,926 43	2,178,401 77	139
Books and apparatus	258,105 90	106,496 79	151,609 11	142
For buildings	3,178,259 19	1,882,358 76	1,295,900 43	142
Total expenditures	$20,665,139 06	$9,497,857 76	$11,167,281 30	117+
Paid out per *pupil enrolled* for—				
Teachers' salaries	$30 06	$19 64	$10 42	----------
Supplies, etc.	8 35	5 17	3 18	----------
Buildings	7 08	6 22	86	----------
Books and apparatus	57	35	22	----------
Total for all purposes	$38 92	$25 16	$13 76	----------
Balance on hand *per pupil enrolled*	$7 49	$8 89	*$1 40	----------
Average annual salary paid all teachers	946 32	720 48	225 86	----------
Average cost per pupil (less cost of buildings) on enrollment	39 05	28 09	10 96	39
Average cost per pupil on average daily attendance	49 88	34 73	15 51	45
Valuation of property—				
Sites and buildings	$55,350,169 00	$25,734,616 00	$29,615,553 00	115
School libraries	1,090,964 00	879,403 00	211,561 00	24
Furniture, apparatus, etc.	3,742,686 00	363,768 00	3,378,918 00	929
Total valuation of property	$60,183,819 00	$26,977,787 00	$33,206,032 00	123

*Loss.

High Schools.

Subject	1918	1907	Gain or loss	Gain or loss per cent
Kinds of schools—				
County	6	14	*8	*57
City	74	41	35	85
District	45	32	13	40
Union	168	86	82	95
Joint union	18	6	12	200
Totals	311	179	132	74—
Number teachers employed—				
Regular:				
Men	1,173	408	765	187+
Women	2,028	736	1,292	175
Special:				
Men	689	12	677	5,643
Women	914	32	882	2,756
Junior college:				
Men	2	----------	2	----------
Women	5	----------	7	----------
Totals	4,811	1,189	3,622	305
Certificates held by teachers—				
Regular high	3,209	1,054	2,155	204
Special high	1,602	135	1,467	1,086
Average number days schools were actually open	178	193	*15	*7.7
Enrollment of pupils—				
First year:				
Boys	30,877	5,327	25,550	479
Girls	40,324	7,101	33,223	462
Second year:				
Boys	10,971	2,941	8,020	272
Girls	14,774	4,312	10,462	242
Third year:				
Boys	6,946	1,763	5,183	294
Girls	9,471	2,614	6,857	262
Fourth year:				
Boys	5,354	1,341	4,013	299
Girls	8,203	2,179	6,024	276
Totals:				
Boys	54,143	11,372	42,771	376
Girls	72,772	16,206	56,566	349
Grand totals	126,915	27,578	99,337	362
Average daily attendance	64,758	21,337	43,421	203

NOTE.—Of the above number 12,213 were enrolled as special students and 1,561 as students in junior college work in the high schools.

*Loss.

High Schools—Continued.

FINANCIAL.

Subject	1918	1907	Gain or loss	Gain or loss per cent
Receipts from—				
Balance on hand	$2,780,993 32	$1,059,446 43	$1,721,546 89	162
State funds	944,020 13	240,950 19	703,069 94	291
County funds	3,911,892 16	----------	3,911,872 16	----------
District funds	4,933,577 32	2,026,682 28	2,906,895 04	143
District funds for buildings	62,657 94	----------	62,657 94	----------
Sale of bonds	543,796 85	----------	543,796 85	----------
Miscellaneous	672,696 72	429,576 56	243,120 16	269
Total receipts	$13,847,614 44	$3,756,655 46	$10,090,958 98	269
Receipts per *pupil enrolled* from—				
Balance on hand	$21 91	$38 41	*$16 50	----------
State funds	7 44	8 74	*1 30	----------
County funds	30 82	----------	30 82	----------
District funds	38 87	73 41	*34 54	----------
Miscellaneous	5 30	15 58	10 28	----------
Total receipts per *pupil enrolled*	$104 82	$136 22	*$31 40	----------
Expenditures for—				
Teachers' salaries	$6,796,729 16	$1,315,728 43	$5,481,728 43	417
Current expenses	1,183,539 70	420,382 24	763,127 46	181
Buildings	2,053,903 69	736,797 91	1,317,105 78	177
Library books	89,577 07	57,499 91	32,071 16	56
Janitors and laborers	784,871 34	----------	784,871 34	----------
Apparatus	191,598 52	----------	191,598 52	----------
Transportation of pupils	220,458 00	----------	220,458 00	----------
Laboratories	111,680 55	----------	111,680 55	----------
Totals	$11,432,328 35	$2,529,680 79	$8,902,647 56	299
Balance on hand	$2,415,286 09	$1,226,974 67	$1,188,311 42	98
Paid out per *pupil enrolled* for—				
Salary of teachers	$53 55	$47 68	$5 87	----------
Janitor and labor	6 18	----------	6 18	----------
Supplies	9 32	†15 23	*5 91	----------
Buildings	16 18	26 71	10 53	----------
Library books	2 21	2 08	13	----------
Totals per *pupil enrolled*	‡$73 89	‡$65 01	$8 88	----------
Paid out per *teacher employed*, annually	$1,412 74	$1,105 97	$306 77	----------
Balance on hand	2,415,286 09	1,226,974 67	1,188,311 42	98
Balance on hand per *pupil enrolled*	19 06	44 41	*25 35	----------
Valuation of property—				
Sites and buildings	$25,977,833 00	$5,277,529 00	$20,700,304 00	392
Laboratories, etc.	3,131,213 00	195,262 00	2,935,951 00	1,503
Library books	594,397 00	153,409 00	440,988 00	287
Total valuation of property	$29,703,443 00	$5,626,200 00	$24,077,243 00	428
Bonded indebtedness outstanding	$14,346,010 00	¶	$14,346,010 00	----------
Number of books in high school libraries	521,496	154,183	367,313	238

*Loss.

†Includes janitors, apparatus and laboratories.

‡Does not include cost of buildings.

¶Not reported.

Section 2.

STATISTICAL TABLES.

KINDERGARTEN SCHOOLS.

TABLE NO. 1. Showing Number of Counties Maintaining, Teachers Employed, Pupils Enrolled, Average Daily Attendance, Average Number of Days Schools Were Maintained.

TABLE NO. 2. Average Annual Salary Paid Supervisors, Principals and Teachers.

TABLE NO. 3. Number of Visits Made by County Superintendents of Schools, by School Trustees, and Number of Volumes in School Libraries.

TABLE NO. 4. Receipts from all Sources, Tax Rates for Maintenance and Buildings, and Expenditures for all Purposes.

TABLE NO. 5. Valuation of all Kindergarten Property, Average Cost per Pupil for Maintenance on Enrollment and on Average Daily Attendance.

KINDERGARTEN SCHOOLS

TABLE No. 1.

Statistics of Kindergarten Schools, showing number of Teachers, Enrollment, Average Attendance, and Average Number of Days School was Maintained, by Counties.

Counties	Total number of teachers employed (all women)		Total enrollment				Average daily attendance		Average number of days schools were maintained	
			1916-17		1917-18					
	1916-17	1917-18	Boys	Girls	Boys	Girls	1916-17	1917-18	1916-17	1917-18
Alameda	55	68	1,791	1,879	1,967	2,320	1,764	2,108	187	198
Contra Costa	4	3	119	137	144	179	113	121	189	188
El Dorado	1	1	11	9	15	14	16	20	170	153
Fresno	5	7	129	116	252	270	126	253	171	171
Humboldt	1	2	11	16	34	33	16	35	174	189
Imperial	6	6	123	137	163	165	137	136	171	168
Kern	11	11	359	353	358	372	331	331	165	161
Lassen	2	2	39	37	30	37	46	43	171	143
Los Angeles	365	378	5,336	5,521	5,811	5,941	6,507	6,910	171	169
Madera	1	1	33	40	31	22	42	35	168	174
Marin	2	2	29	51	41	60	36	39	170	185
Merced*	------	1	--------	--------	17	23	--------	35	------	162
Napa	1	1	14	11	12	17	17	12	188	180
Orange	12	22	280	332	306	373	338	372	168	167
Riverside	15	12	222	199	220	219	247	251	180	168
Sacramento	30	28	491	494	524	535	457	456	183	173
San Bernardino	17	14	290	332	324	337	367	365	178	167
San Diego	15	38	622	673	820	905	608	753	182	175
San Francisco	14	22	577	578	838	870	524	741	195	183
San Joaquin	3	3	104	107	142	105	108	97	182	179
San Luis Obispo	1	2	12	16	46	57	22	61	171	154
San Mateo	6	6	192	208	187	201	212	198	189	191
Santa Barbara	9	11	212	207	233	240	195	200	------	200
Santa Clara	13	15	301	340	387	423	353	371	184	180
Santa Cruz	1	1	29	27	32	31	21	25	190	191
Siskiyou	1	1	10	16	17	12	17	17	133	169
Solano	2	2	46	45	46	51	53	47	138	177
Stanislaus	1	1	15	21	14	16	20	18	173	171
*Tehama	------	2	--------	--------	18	52	--------	38	------	146
Tulare	1	3	16	26	61	67	20	64	172	120
*Tuolumne	------	1	--------	--------	11	14	--------	24	------	190
Ventura	3	3	75	92	103	103	91	96	182	186
Yolo	1	1	21	31	25	23	24	20	179	180
*Yuba	------	1	--------	--------	22	12	--------	19	------	167
Totals	599	672	11,509	12,051	13,251	14,099	12,828	14,311	†175	†173

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*First year of school.

†Average for state.

See Statistical Summary for segregated totals.

TABLE No. 2.

Statistics of Kindergarten Schools, Showing Average Annual Salary Paid Supervisors, Principals and Teachers. All Women.

Counties	Average annual salary paid			
	1916-17		1917-18	
	Number	Salary	Number	Salary
Supervisors.				
Los Angeles	1	$1,200 00	2	$2,010 00
Sacramento	1	1,525 00	1	1,500 00
San Bernardino	--------	------------	2	1,059 00
Santa Barbara	1	1,000 00	1	1,000 00
Totals	3	†$1,241 67	6	†$1,439 66
Principals.				
Alameda	13	$989 64	13	$1,016 00
Fresno	1	900 00	2	946 00
Kern	1	1,323 75	1	1,125 00
Los Angeles	187	941 12	233	901 35
Riverside	6	740 00	3	770 00
Sacramento	17	910 00	16	927 68
San Diego	--------	------------	12	867 50
Totals	225	†$933 29	280	†$905 69
Teachers.				
Alameda	42	$1,027 01	55	$1,009 00
Contra Costa	4	1,047 00	3	1,200 00
El Dorado	1	595 00	1	546 25
Fresno	4	700 00	5	738 00
Humboldt	1	800 00	2	800 00
Imperial	6	742 75	6	759 00
Kern	10	946 68	10	1,051 16
Lassen	2	742 50	2	761 25
Los Angeles	177	727 48	143	747 28
Madera	1	925 00	1	950 00
Marin	2	825 00	2	930 00
Merced	--------	------------	1	900 00
Napa	1	780 00	1	838 00
Orange	12	847 29	22	519 37
Riverside	9	643 00	9	706 00
Sacramento	12	742 83	11	627 14
San Bernardino	17	758 00	12	787 00
San Diego	15	1,230 93	26	648 08
San Francisco	14	901 71	22	923 59
San Joaquin	3	706 00	3	840 00
San Luis Obispo	1	840 00	2	775 60
San Mateo	6	854 17	6	935 00
Santa Barbara	8	679 38	10	715 00
Santa Clara	13	601 23	15	791 16
Santa Cruz	1	800 00	1	800 00
Siskiyou	1	525 00	1	600 00
Solano	2	712 50	2	832 50
Stanislaus	1	485 00	1	630 00
Tehama	--------	------------	2	518 75
Tulare	1	810 00	3	791 67
Tuolumne	--------	------------	1	750 00
Ventura	3	873 33	3	926 87
Yolo	1	665 00	1	665 00
Yuba	--------	------------	1	750 00
Totals	371	†$799 33	386	†$789 30

†Average.
See Statistical Summary for segregated totals.

TABLE No. 3.

Statistics of Kindergarten Schools Showing Number of Visits to Schools by School Officers, and Number of Volumes in School Libraries.

Counties	Number of visits by County Superintendent of Schools		Number of visits by school trustees		Number of volumes in school libraries	
	1916-17	1917-18	1916-17	1917-18	1916-17	1917-18
Alameda	22	22	136	90	345	427
Contra Costa	1	2	2	2	100	150
El Dorado	3	1	1	1	15	18
Fresno	4	4	6	7	17	21
Humboldt	1	2	--------	2	14	--------
Imperial	3	5	11	8	28	35
Kern	12	13	32	36	59	77
Lassen	2	2	9	3	9	9
Los Angeles	378	437	177	198	756	875
Madera	1	1	3	--------	--------	1
Marin	5	5	5	--------	--------	14
Merced	--------	1	--------	--------	--------	--------
Napa	3	2	--------	--------	--------	10
Orange	7	9	8	10	175	467
Riverside	4	2	50	34	9	11
Sacramento	--------	--------	--------	8	197	272
San Bernardino	12	14	24	21	841	625
San Diego	17	10	57	61	228	292
San Francisco	40	46	24	43	36	62
San Joaquin	--------	20	13	6	22	31
San Luis Obispo	1	--------	5	9	3	5
San Mateo	10	13	14	12	43	87
Santa Barbara	3	8	29	13	199	223
Santa Clara	10	15	16	20	40	55
Santa Cruz	1	1	--------	2	50	16
Siskiyou	1	1	3	4	--------	--------
Solano	2	2	4	--------	--------	--------
Stanislaus	2	1	--------	1	--------	--------
Tehama	--------	1	--------	1	--------	6
Tulare	--------	3	--------	1	--------	--------
Tuolumne	--------	1	--------	--------	--------	--------
Ventura	4	4	--------	2	56	23
Yolo	1	1	1	1	42	38
Yuba	--------	2	--------	--------	--------	6
Totals	550	650	630	596	3,284	3,846

See Statistical Summary for segregated totals.

TABLE No. 4.

Statistics of Kindergarten Schools, Showing Receipts, Tax Rates, Expenditures, by Counties.

Counties	Receipts from all sources, including balance on hand		Average tax rate for				Total expenditures	
			Maintenance		Building			
	1916-17	1917-18	1916-17	1917-18	1916-17	1917-18	1916-17	1917-18
Alameda	$85,069 59	$105,388 76	0.04	0.55	--------	--------	$81,351 77	$99,521 84
Contra Costa	6,474 31	6,431 96	.03	.025	--------	--------	4,118 06	3,933 11
El Dorado	858 17	973 28	.10	.10	--------	--------	786 03	673 28
Fresno	6,181 24	10,948 02	.07	--------	--------	--------	4,232 49	8,084 27
Humboldt	1,823 96	2,048 24	.18	.10	--------	--------	1,377 20	1,841 05
Imperial	10,184 50	9,453 93	.066	.072	--------	--------	8,430 16	7,422 20
Kern	20,062 15	23,652 60	.08	.056	--------	--------	15,735 40	18,441 34
Lassen	2,010 34	2,208 15	.085	.065	--------	--------	1,621 19	1,530 40
Los Angeles	526,301 83	488,975 96	.065	.077	--------	--------	481,739 98	437,816 31
Madera	2,069 77	2,029 41	.093	.068	--------	--------	1,625 33	1,281 10
Marin	2,506 59	3,431 79	.08	.09	--------	--------	1,974 96	2,388 83
Merced	------------	2,016 75	--------	.10	--------	--------	------------	1,679 60
Napa	1,173 31	1,334 32	.08	.07	--------	--------	838 99	838 00
Orange	18,737 37	21,299 96	.075	.086	--------	--------	15,607 66	19,925 98
Riverside	15,855 03	16,212 10	.09	.085	--------	--------	10,862 06	10,419 91
Sacramento	34,495 30	32,124 03	.055	.055	--------	--------	34,485 69	29,254 48
San Bernardino	29,602 80	24,626 12	.08	.076	--------	--------	20,942 71	15,360 77
San Diego	52,553 45	50,094 69	.09	.09	--------	--------	39,471 85	40,246 11
San Francisco	15,363 53	22,107 99	.0028	.004	--------	--------	15,363 53	22,107 99
San Joaquin	4,250 00	4,144 49	.013	.012	--------	--------	3,132 15	2,855 88
San Luis Obispo	3,981 85	6,688 94	.08	.095	0.10	--------	1,349 11	6,143 06
San Mateo	8,042 82	9,257 72	.06	.062	--------	--------	6,768 49	7,128 37
Santa Barbara	12,580 62	14,041 67	.0985	.097	--------	--------	9,108 95	11,141 63
Santa Clara	14,285 74	18,875 17	.057	.057	--------	--------	13,194 59	16,131 42
Santa Cruz	2,270 60	2,255 04	.055	.04	--------	--------	1,451 57	1,396 75
Siskiyou	829 48	862 50	--------	.10	--------	--------	689 47	775 02
Solano	3,311 25	3,527 21	.045	.07	.05	--------	2,768 78	3,093 04
Stanislaus	1,032 19	1,418 06	.10	.10	--------	--------	706 21	640 91
Tehama	------------	2,486 75	--------	.095	--------	--------	------------	1,437 20
Tulare	1,700 28	5,105 90	.10	.093	--------	--------	1,453 91	4,624 66
Tuolumne	------------	1,126 94	--------	.10	--------	--------	------------	1,028 75
Ventura	4,321 56	4,549 35	.048	.046	--------	--------	2,898 76	3,088 36
Yolo	986 08	1,068 74	.03	.03	--------	--------	758 81	733 19
Yuba	------------	1,460 65	--------	.05	--------	--------	------------	913 82
Totals	$888,915 71	$902,227 19	†0.07	†0.0703	†0.075	--------	$784,845 86	$783,898 63

†Average.

See Statistical Summary for segregated totals.

TABLE No. 5.

Statistics of Kindergarten Schools Showing Valuation of All Property and Average Cost Per Pupil Per Annum for Education of Kindergarten Children, Not Including Cost of Buildings.

Counties	Valuation of all kindergarten property		Average cost per pupil for maintenance not including cost of buildings		
			On enrollment		On attendance
	1916-17	1917-18	1916-17	1917-18	1917-18
Alameda	$23,862 00	$43,989 00	$20 62	$19 47	$43 79
Contra Costa	--------------	--------------	16 08	12 17	32 50
El Dorado	220 00	300 00	39 30	23 22	32 96
Fresno	2,600 00	3,510 00	17 27	15 48	31 95
Humboldt	500 00	--------------	45 44	27 56	52 77
Imperial	1,812 00	540 00	26 70	22 32	44 92
Kern	5,146 00	5,611 00	20 82	25 08	55 32
Lassen	155 00	155 00	27 33	22 83	35 58
Los Angeles	--------------	2,600 00	43 99	37 25	63 36
Madera	--------------	--------------	29 17	24 36	33 43
Marin	--------------	450 00	22 00	23 65	60 99
Merced	--------------	1,000 00	----------	17 37	19 85
Napa	--------------	--------------	49 34	28 95	70 00
Orange	32,544 00	35,369 00	39 02	26 64	48 63
Riverside	14,175 00	14,871 00	43 97	22 19	38 77
Sacramento	27,300 00	27,300 00	35 01	27 13	63 02
San Bernardino	6,450 00	6,445 00	23 82	22 52	40 80
San Diego	1,956 00	7,856 00	29 04	19 36	44 86
San Francisco	6,590 00	1,686 00	13 30	12 94	29 84
San Joaquin	342 00	342 00	29 00	11 52	29 44
San Luis Obispo	132 00	4,247 00	47 92	26 57	44 87
San Mateo	6,600 00	6,800 00	16 90	18 37	36 00
Santa Barbara	15,536 00	15,936 00	21 65	22 95	54 27
Santa Clara	16,834 00	16,882 00	20 58	19 91	43 48
Santa Cruz	--------------	--------------	69 12	22 17	55 87
Siskiyou	175 00	100 00	27 00	27 20	40 88
Solano	2,030 00	2,400 00	23 10	27 45	56 65
Stanislaus	80 00	80 00	19 61	21 36	35 61
Tehama	--------------	--------------	----------	20 53	37 82
Tulare	165 00	255 00	72 70	36 13	79 00
Tuolumne	--------------	240 00	----------	35 60	32 17
Ventura	5,150 00	5,200 00	17 36	14 99	36 66
Yolo	315 00	315 00	14 59	15 27	55 60
Yuba	--------------	78 00	----------	26 80	---------
Totals	$170,669 00	$204,557 00	†$32 15	†$27 68	†$52 91

†Average.
See Statistical Summary for segregated valuations.

Section 3.

ELEMENTARY SCHOOLS

PRIMARY AND GRAMMAR SCHOOLS—EIGHT GRADES

TABLE NO. 6. Showing Number of School Districts at Close of Year, Number of Teachers Allowed Districts on Average Daily Attendance, and Number of Teachers Employed.

TABLE NO. 7. Grade of Certificates Held by Teachers Employed.

TABLE NO. 8. Number of District Superintendents and Average Salary, Number of Principals and Average Salary, Number of Regular Teachers and Average Salary, Number of Supervisors and Average Salary, Number of Special Teachers and Average Salary.

TABLE NO. 9. Total Number of Pupils Enrolled in Regular Elementary Schools, Boys and Girls; Total Number of Pupils Enrolled in Post Graduate Grammar Schools, Boys and Girls; Total Number of Pupils Enrolled in all Grades in Regular Elementary Schools, in Postgraduate Schools.

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TABLE NO. 16. Valuation of Property, Sites and Buildings, Libraries and Apparatus.

PRIMARY AND GRAMMAR SCHOOLS (EIGHT GRADES).

TABLE No. 6.

Statistics of Elementary Schools, Showing Number of Districts and Number of Teachers.

Counties	Number of school districts at close of year					
	1916-17			1917-18		
	Regular active	Union	Suspended	Regular active	Union	Suspended
Alameda	43			44		
Alpine	3			2		1
Amador	39		3	39		3
Butte	75		1	72		3
Calaveras	46		5	49		3
Colusa	34		1	34		
Contra Costa	52	1	1	54		
Del Norte	16			15	1	
El Dorado	52		5	51		5
Fresno	146	1	1	154	1	
Glenn	41	1		42	1	
Humboldt	105		3	104		5
Imperial	51			50		
Inyo	24			26		
Kern	98			100		
Kings	38			40		
Lake	37		2	37		2
Lassen	45			44		1
Los Angeles	157		2	148		4
Madera	44	1	1	46	1	1
Marin	45		2	45		2
Mariposa	28		1	33		1
Mendocino	124	1	2	122	1	5
Merced	57	2	1	65	2	1
Modoc	41			44		
Mono	10	1		11	1	
Monterey	79	3	3	81	4	3
Napa	46	1	1	50	1	
Nevada	46			46		
Orange	45	2		48	2	
Placer	51			54		
Plumas	31			32		
Riverside	66	2		67	3	
Sacramento	73	2	1	75	2	1
San Benito	32	1	5	34	1	5
San Bernardino	81	1	2	75	1	9
San Diego	115		3	112	1	6
San Francisco	1			1		
San Joaquin	87	1	1	87	1	3
San Luis Obispo	92		1	92		
San Mateo	35		2	36		
Santa Barbara	63	1		64	1	
Santa Clara	78			79	1	
Santa Cruz	51	1	2	54	1	
Shasta	106		2	105		5
Sierra	15			16		2
Siskiyou	88	4		92	4	
Solano	49		1	51		1
Sonoma	145		5	147		4
Stanislaus	58			60		1
Sutter	35			34		
Tehama	64		2	64		1
Trinity	24		1	27		2
Tulare	125		1	131		1
Tuolumne	32			33		
Ventura	51	1		50	2	
Yolo	46		1	46		
Yuba	39			39		
Totals	3,400	*28	65	3,453	*33	81

*Included in "active."

TABLE No. 6—Continued.

Statistics of Elementary Schools, Showing Number of Teachers Allowed and Employed.

Counties	Number of teachers allowed on attendance		Total number of teachers actually employed in each county			
			1916-17		1917-18	
	1916-17	1917-18	Men	Women	Men	Women
Alameda	1,071.68	1,101.79	148	1,072	136	1,139
Alpine	3	2	----------	3	----------	2
Amador	60.36	58.57	7	56	7	56
Butte	143	140	18	147	13	148
Calaveras	61.43	60.53	13	50	8	56
Colusa	52.05	51.16	9	48	3	53
Contra Costa	218.32	223.21	18	216	19	229
Del Norte	21	20	4	18	4	18
El Dorado	59.94	55.81	6	54	6	53
Fresno	538.04	554.02	60	513	52	542
Glenn	61.83	62.62	11	59	11	62
Humboldt	198	197	21	185	18	190
Imperial	118	126	18	149	13	182
Inyo	35	37	5	31	2	36
Kern	237	246	15	251	15	265
Kings	105.88	105.92	12	95	12	103
Lake	45.33	44.33	5	40	5	40
Lassen	55	54	11	46	11	46
Los Angeles	2,530.49	2,584.53	265	2,818	260	2,948
Madera	74.11	72.17	6	80	8	79
Marin	105.83	101.56	6	107	6	110
Mariposa	33.82	31.94	1	27	1	32
Mendocino	171	164	18	149	14	151
Merced	120.69	127.23	13	115	12	124
Modoc	55	53	11	44	13	44
Mono	12	12	2	10	1	11
Monterey	147.22	149.32	9	137	7	144
Napa	87.82	86.83	5	82	6	82
Nevada	82	78	6	73	5	73
Orange	221.59	216.55	26	256	30	267
Placer	97.89	96.81	15	86	8	90
Plumas	37	36	5	31	5	32
Riverside	197.31	193.24	27	224	23	226
Sacramento	299.47	304.33	21	394	19	408
San Benito	50.75	51.44	3	44	2	48
San Bernardino	311.13	292.09	26	349	21	352
San Diego	377.56	375.67	31	418	36	415
San Francisco	1,325	1,316	52	1,295	46	1,418
San Joaquin	271.26	286.49	41	255	47	279
San Luis Obispo	134	135	12	132	9	137
San Mateo	149	153	11	150	11	158
Santa Barbara	138.14	148.29	15	150	15	158
Santa Clara	353.97	357.37	27	380	20	384
Santa Cruz	123.06	116.87	9	141	7	143
Shasta	128	126	8	119	4	125
Sierra	19	20	3	16	3	18
Siskiyou	137	138	16	114	13	119
Solano	119.95	125.83	9	114	7	122
Sonoma	273.17	263.44	26	262	22	264
Stanislaus	194.67	196.79	16	188	16	197
Sutter	49	48	10	46	8	47
Tehama	89.37	89.65	15	90	12	91
Trinity	28	29	2	24	2	27
Tulare	274.14	277.06	24	257	31	272
Tuolumne	54.30	54.33	5	49	4	50
Ventura	115.78	119.63	7	129	7	138
Yolo	76.65	77.58	12	74	11	76
Yuba	58	58	8	54	5	58
Totals	12,209	12,303	1,215	12,516	1,112	13,137

TABLE No. 7.

Kinds of Certificates Held by Teachers Employed in Elementary Schools.

Counties	Kinds of certificates held by teachers							
	High school		Elementary (grammar school)		Primary		Special	
	1916-17	1917-18	1916-17	1917-18	1916-17	1917-18	1916-17	1917-18
Alameda	158	147	944	999	4	10	114	119
Alpine	-----	-----	3	2	-----	-----	-----	-----
Amador	2	1	60	61	-----	-----	1	1
Butte	3	2	160	157	-----	-----	2	2
Calaveras	-----	-----	63	64	-----	-----	-----	-----
Colusa	1	2	54	52	-----	-----	2	2
Contra Costa	1	3	226	233	1	2	6	10
Del Norte	-----	-----	21	21	1	1	-----	-----
El Dorado	-----	-----	60	59	-----	-----	-----	-----
Fresno	7	5	561	588	-----	-----	5	1
Glenn	1	1	67	71	2	1	-----	-----
Humboldt	2	2	194	198	2	2	8	6
Imperial	3	4	159	181	-----	-----	5	10
Inyo	-----	-----	36	37	-----	-----	-----	1
Kern	3	2	256	273	-----	-----	7	5
Kings	3	3	102	110	-----	-----	2	2
Lake	-----	-----	44	44	-----	-----	1	1
Lassen	1	1	56	56	-----	-----	-----	-----
Los Angeles	152	160	2,597	2,719	15	12	319	317
Madera	-----	1	83	83	-----	-----	3	3
Marin	1	1	112	114	-----	-----	-----	1
Mariposa	-----	-----	28	33	-----	-----	-----	-----
Mendocino	1	-----	165	165	-----	-----	1	-----
Merced	-----	-----	127	135	-----	-----	1	1
Modoc	-----	1	55	56	-----	-----	-----	-----
Mono	-----	1	12	11	-----	-----	-----	-----
Monterey	2	3	139	145	3	2	2	1
Napa	2	1	84	86	-----	-----	1	1
Nevada	-----	-----	76	76	1	-----	2	2
Orange	5	5	262	273	-----	-----	15	19
Placer	-----	-----	100	98	-----	-----	1	-----
Plumas	-----	1	36	36	-----	-----	-----	-----
Riverside	3	6	229	232	4	3	15	8
Sacramento	5	4	390	403	-----	-----	20	20
San Benito	1	1	44	49	-----	-----	2	-----
San Bernardino	4	6	347	346	2	3	22	18
San Diego	14	7	415	420	4	4	16	20
San Francisco	94	113	1,163	1,225	20	25	70	101
San Joaquin	2	1	275	300	-----	-----	19	25
San Luis Obispo	2	2	139	139	-----	-----	3	5
San Mateo	5	6	147	153	1	1	8	9
Santa Barbara	4	5	138	151	2	-----	21	17
Santa Clara	17	16	383	381	4	4	3	3
Santa Cruz	5	5	138	138	-----	-----	7	7
Shasta	-----	-----	127	129	-----	-----	-----	-----
Sierra	-----	-----	19	21	-----	-----	-----	-----
Siskiyou	1	1	129	131	-----	-----	-----	-----
Solano	4	4	119	124	-----	-----	-----	1
Sonoma	7	6	274	271	-----	-----	7	9
Stanislaus	5	4	197	204	-----	-----	2	5
Sutter	1	1	55	53	-----	-----	-----	1
Tehama	-----	-----	102	101	-----	-----	3	2
Trinity	-----	1	26	28	-----	-----	-----	-----
Tulare	2	2	281	297	-----	-----	8	4
Tuolumne	-----	-----	54	54	-----	-----	-----	-----
Ventura	4	4	126	139	-----	-----	6	2
Yolo	3	2	79	81	-----	-----	4	4
Yuba	-----	-----	60	61	-----	-----	2	2
Totals	531	544	12,398	12,867	66	70	736	768

TABLE No. 8.

Statistics of Elementary Schools, Showing Number of District Superintendents, and Average Annual Salary Paid Each.

Counties	1916–1917				1917–1918			
	Men		Women		Men		Women	
	Number	Salary	Number	Salary	Number	Salary	Number	Salary
District Superintendents								
Alameda	45	$2,152 66	12	$1,966 66	46	$2,112 00	14	$1,872 85
Butte	2	2,075 00	--------	----------	3	1,485 00	--------	----------
Contra Costa	4	1,980 00	1	1,500 00	5	2,008 00	2	1,725 00
Fresno	6	1,922 08	1	1,425 00	5	2,950 00	1	1,440 00
Humboldt	--------	----------	--------	----------	--------	----------	1	1,300 00
Imperial	3	1,800 00	--------	----------	4	1,800 00	--------	----------
Kern	3	2,306 66	4	1,365 00	4	1,465 00	5	1,317 24
Kings	2	2,100 00	--------	----------	1	2,500 00	--------	----------
Lassen	1	1,500 00	--------	----------	1	1,500 00	--------	----------
Los Angeles	54	2,097 65	56	1,977 50	56	2,147 59	61	2,038 03
Madera	1	1,800 00	--------	----------	--------	----------	--------	----------
Marin	3	2,032 00	--------	----------	3	2,192 00	--------	----------
Mendocino	--------	----------	--------	----------	1	1,900 00	--------	----------
Merced	2	1,800 00	--------	----------	2	1,860 00	--------	----------
Monterey	--------	----------	--------	----------	1	1,872 00	--------	----------
Orange	3	1,870 00	--------	----------	5	1,785 00	--------	----------
Placer	1	1,500 00	--------	----------	1	1,800 00	--------	----------
Riverside	2	1,282 00	1	1,440 00	1	1,440 00	1	1,440 00
Sacramento	2	2,031 42	14	1,972 58	2	1,976 04	14	1,861 92
San Bernardino	2	1,829 00	1	1,350 00	4	2,586 00	3	1,381 00
San Diego	6	2,004 00	1	2,004 00	8	2,053 00	1	2,004 00
San Francisco	10	1,938 00	69	2,035 65	10	1,920 00	69	2,020 12
San Joaquin	1	1,800 00	--------	----------	1	1,850 00	--------	----------
San Mateo	5	2,200 00	--------	----------	5	2,304 00	--------	----------
Santa Barbara	1	----------	--------	----------	1	----------	--------	----------
Santa Clara	9	1,861 22	2	1,800 00	9	1,800 00	3	1,450 00
Santa Cruz	1	1,250 00	--------	----------	--------	----------	--------	----------
Sonoma	3	1,620 00	1	400 00	3	1,200 00	--------	----------
Stanislaus	1	1,800 00	--------	----------	2	1,230 00	--------	----------
Tehama	1	1,500 00	--------	----------	1	1,500 00	--------	----------
Tulare	3	2,051 66	1	1,600 00	4	2,163 75	--------	----------
Ventura	3	1,931 66	--------	----------	2	1,600 00	--------	----------
Yolo	1	1,800 00	--------	----------	1	1,800 00	--------	----------
Yuba	1	1,800 00	--------	----------	1	1,900 00	--------	----------
Totals	182	†$2,041 89	164	†$1,960 70	190	†$2,035 80	175	†$1,943 79
Principals of Schools								
Alameda	17	$1,392 05	16	$1,211 25	14	$1,367 00	14	$1,346 00
Amador	6	968 75	1	675 00	6	1,061 25	1	765 00
Butte	8	936 87	15	867 00	6	1,093 66	16	877 18
Calaveras	6	938 66	1	810 00	5	968 00	3	775 00
Colusa	5	1,201 00	2	922 50	3	1,343 33	4	956 25
Contra Costa	6	1,411 66	14	1,017 57	8	1,279 25	11	1,267 45
Del Norte	--------	----------	2	912 50	1	850 00	2	962 50
El Dorado	1	972 00	1	680 00	--------	----------	3	713 33
Fresno	41	1,155 67	54	816 43	42	1,310 71	61	860 63
Glenn	7	1,008 57	3	720 00	6	1,131 67	4	765 00
Humboldt	11	1,100 90	21	943 80	11	1,115 45	21	957 52
Imperial	8	1,091 25	17	873 23	3	1,250 00	33	901 33
Inyo	2	1,162 50	--------	----------	2	1,350 00	4	762 50
Kern	5	1,231 00	28	972 94	5	1,013 00	29	1,067 74
Kings	5	981 00	10	954 05	7	1,076 43	12	947 90
Lake	4	834 00	1	640 00	4	820 00	1	680 00
Lassen	1	1,215 00	--------	----------	1	1,215 00	--------	----------
Los Angeles	74	1,476 80	153	1,168 45	76	1,433 92	203	1,043 98
Madera	1	990 00	10	854 25	3	1,185 00	8	877 65
Marin	3	1,473 33	18	1,108 44	2	1,755 00	19	1,112 00
Mariposa	--------	----------	--------	----------	--------	----------	1	900 00
Mendocino	9	1,041 66	4	768 75	8	971 87	3	793 00
Merced	9	922 50	13	800 00	10	966 80	14	846 88
Modoc	4	975 00	3	777 50	4	1,016 88	2	723 50

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†Average.

TABLE No. 8—Continued.

Statistics of Elementary Schools, Showing Number of Principals and Average Annual Salary Paid Each.

Counties	1916-1917				1917-1918			
	Men		Women		Men		Women	
	Number	Salary	Number	Salary	Number	Salary	Number	Salary
Principals of Schools— (Continued)								
Mono	1	$900 00					1	$900 00
Monterey	6	1,313 33	11	$956 00	4	$1,350 00	14	986 25
Napa	4	1,343 00	3	758 33	4	1,473 75	6	827 16
Nevada	1	1,000 00	1	1,250 00	2	1,069 25	1	900 00
Orange	15	1,246 33	31	872 43	13	1,132 69	34	881 54
Placer	7	1,035 71	2	842 50	5	1,153 00	6	897 29
Plumas	2	877 50	1	765 00	2	850 00		
Riverside	13	1,109 00	26	877 00	15	1,113 00	24	906 00
Sacramento	1	747 50	6	1,348 79			5	1,362 86
San Benito	2	1,440 00	3	688 00	2	1 450 00	5	752 50
San Bernardino	13	1,180 00	42	972 00	11	1,370 00	44	940 00
San Diego	11	1,339 55	26	1,037 11	11	1,424 85	31	982 45
San Francisco	1	660 00	10	1,362 00	6	660 00	12	1,402 00
San Joaquin	24	1,298 00	21	911 00	23	1,342 36	27	895 40
San Luis Obispo	7	1,207 50	9	786 38	6	1,240 83	12	773 50
San Mateo	3	1,320 00	14	1,164 82	3	1,340 00	15	1.171 33
Santa Barbara	10	1,180 00	9	1,111 25	9	1,285 56	13	1,049 62
Santa Clara	9	1,164 44	35	868 41	7	1,095 00	38	870 09
Santa Cruz	4	1,221 62	13	966 01	5	1,302 00	12	973 27
Shasta	2	1,237 50	3	930 00	2	1,147 50	4	932 50
Sierra	3	866 67	1	995 00	3	897 50	1	990 00
Siskiyou	9	990 00	4	923 75	8	1,035 93	5	885 40
Solano	6	1,456 66	8	1,084 17	6	1,525 00	8	1,101 67
Sonoma	11	1,030 00	24	878 00	12	1,446 96	26	937 56
Stanislaus	8	1,125 62	23	833 91	10	1.162 50	25	863 60
Sutter	6	967 50	3	751 25	5	1,008 00	3	809 58
Tehama	5	927 00	9	723 61	3	1,005 00	3	810 00
Trinity	1	850 00			1	900 00		
Tulare	22	1,098 18	24	921 72	20	1.104 08	28	922 14
Tuolumne	4	975 93	3	1,095 83	3	1.028 33	4	1.009 37
Ventura	3	1,160 00	13	888 46	5	1.554 40	16	942 00
Yolo	6	1,025 00	7	869 57	5	1,101 50	8	917 21
Yuba	2	900 00			1	1,121 25		
Totals	455	†$1,192 12	772	†$976 84	439	†$1,236 41	900	†$970 83
Regular Teachers								
Alameda	45	$933 77	976	$1,095 89	27	$1,082 00	1,037	$1.149 07
Alpine			3	688 33			2	700 00
Amador	1	292 50	54	641 07	1	695 00	54	652 97
Butte	7	883 57	130	699 55	4	928 12	129	720 16
Calaveras	6	646 66	50	673 77	3	698 33	53	668 20
Colusa	4	708 75	44	696 00			46	745 16
Contra Costa	4	945 00	193	897 97	1	950 00	208	947 53
Del Norte	4	745 94	16	665 00	3	729 16	16	689 00
El Dorado	5	585 00	53	585 73	6	592 00	50	541 32
Fresno	9	1,124 25	450	824 41	7	1,201 71	480	844 26
Glenn	4	810 62	54	682 10	5	882 00	57	712 63
Humboldt	8	744 87	158	766 91	5	721 20	161	779 65
Imperial	6	736 66	127	712 69	1	760 00	143	707 67
Inyo	3	753 00	31	699 00			32	708 76
Kern	5	632 00	213	793 53	4	646 25	226	869 49
Kings	5	798 00	83	787 54	3	795 00	90	790 40
Lake	1	520 00	38	568 00	1	560 00	38	560 00
Lassen	9	769 28	46	654 24	9	757 77	46	675 82
Los Angeles	59	1,109 25	2,340	1,009 52	45	1,118 31	2,396	1,015 60
Madera	1	990 00	69	721 92	3	653 65	70	707 85
Marin			87	894 41			90	888 24
Mariposa	1	569 50	27	650 05	1	924 50	31	607 22
Mendocino	9	605 55	144	622 22	5	521 00	148	625 90
Merced	2	725 00	102	731 20	1	720 00	108	735 01

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†Average.

TABLE No. 8—Continued.

Statistics of Elementary Schools, Showing Number of Teachers and Average Annual Salary Paid Each.

Counties	1916–1917				1917–1918			
	Men		Women		Men		Women	
	Number	Salary	Number	Salary	Number	Salary	Number	Salary
Regular Teachers— (Continued)								
Modoc	7	$658 85	41	$637 30	9	$692 22	42	$660 80
Mono	1	9[illegible]0 00	10	713 50	1	925 00	10	779 50
Monterey	3	700 00	124	735 00	2	775 00	129	761 00
Napa	1	1,320 00	78	734 52	2	975 00	75	752 70
Nevada	4	861 00	71	738 00	2	837 50	71	726 45
Orange	5	959 00	213	773 53	3	765 00	223	748 33
Placer	7	629 28	84	697 41	2	885 00	84	832 99
Plumas	3	630 00	30	684 00	3	725 00	32	695 00
Riverside	4	755 00	189	715 00	2	850 00	198	673 00
Sacramento	10	945 75	357	1,015 98	7	1,046 43	373	118 36
San Benito	1	675 00	39	662 78	--------	----------	43	664 00
San Bernardino	3	792 00	291	774 00	2	994 00	292	780 00
San Diego	7	763 43	372	88[illegible] 27	5	763 20	371	873 64
San Francisco	20	912 00	1,166	1.078 00	8	959 88	1.259	1,098 44
San Joaquin	8	949 00	223	848 00	11	951 60	239	866 38
San Luis Obispo	4	627 50	121	642 82	2	912 50	121	712 05
San Mateo	2	967 50	128	963 51	2	976 25	133	915 33
Santa Barbara	1	1,100 00	127	778 55	1	1.200 00	132	833 77
Santa Clara	4	536 06	336	858 41	1	1,320 00	334	888 24
Santa Cruz	1	850 00	121	756 98	1	900 00	123	745 70
Shasta	6	600 00	116	631 54	2	620 00	121	635 30
Sierra	--------	----------	15	673 93	--------	----------	17	687 50
Siskiyou	6	640 83	11[illegible]	634 90	6	670 40	113	562 65
Solano	3	1,040 00	106	831 34	--------	----------	114	795 16
Sonoma	10	716 00	235	725 00	6	917 50	236	735 82
Stanislaus	7	868 57	163	724 28	3	785 00	164	783 20
Sutter	4	798 75	43	717 53	2	877 50	44	733 73
Tehama	8	704 37	79	635 32	7	734 28	87	646 45
Trinity	1	600 00	24	598 54	1	600 00	27	604 00
Tulare	6	915 83	226	791 24	4	859 37	239	776 05
Tuolumne	1	6[illegible]0 00	46	700 70	1	765 00	46	677 77
Ventura	--------	----------	113	760 75	--------	----------	120	763 66
Yolo	3	725 00	65	741 70	3	735 00	65	768 27
Yuba	5	673 00	52	706 60	3	660 00	56	734 69
Totals	354	†$855 00	11,002	†$887 63	239	†$905 00	11,441	†$895 90
Supervisors of Subjects								
Alameda	10	$1,428 50	22	$1,143 88	9	$1,752 00	18	$1,488 00
Butte	--------	----------	3	916 66	--------	----------	3	933 33
Contra Costa	1	1,400 00	--------	----------	1	600 00	--------	----------
Fresno	4	1,562 50	4	961 25	1	765 00	--------	----------
Humboldt	--------	----------	3	1,133 33	1	1,300 00	5	1,040 00
Kern	--------	----------	1	1,100 00	--------	----------	--------	----------
Kings	--------	----------	--------	----------	--------	----------	2	832 50
Los Angeles	22	1,940 41	58	1,614 96	30	1,764 87	61	1,634 16
Marin	--------	----------	1	1,350 00	--------	----------	1	1,535 00
Monterey	--------	----------	2	825 00	--------	----------	1	650 00
Nevada	--------	----------	--------	----------	--------	----------	1	600 00
Orange	1	1,100 00	1	800 00	--------	----------	--------	----------
Sacramento	2	1,533 75	5	1,607 62	2	1,506 30	5	1,717 39
San Diego	3	1,533 33	5	1,471 20	3	1,673 33	7	1.3[illegible]8 57
San Francisco	2	1,860 00	13	1.349 00	2	2,250 00	9	1,773 33
San Joaquin	1	1,740 00	2	1,620 00	1	1,740 00	2	1,710 00
Santa Barbara	--------	----------	--------	----------	2	600 00	--------	----------
Santa Clara	1	1,600 35	1	691 60	1	1,771 50	1	1,421 50
Santa Cruz	--------	----------	4	995 00	--------	----------	--------	----------
Tehama	--------	----------	1	750 00	--------	----------	--------	----------
Ventura	--------	----------	1	848 75	--------	----------	--------	----------
Yolo	--------	----------	--------	----------	1	100 00	--------	----------
Totals	47	†$1,737 27	127	†$1,399 88	54	†$1,673 61	116	†$1,625 88

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†Average.

TABLE No. 8—Continued.

Statistics of Elementary Schools, Showing Number of Special Teachers and Average Annual Salary Paid Each.

Counties	1916–1917				1917-1918			
	Men		Women		Men		Women	
	Number	Salary	Number	Salary	Number	Salary	Number	Salary
Special Teachers								
Alameda	30	$1,147 18	47	$1,083 40	39	$1,267 00	57	$946 00
Amador			1	760 00			1	780 00
Colusa			2	360 00			3	335 00
Contra Costa	2	1,230 00	9	823 33	4	1,276 50	8	1,225 25
Fresno			4	979 00				
Glenn			2	742 50			1	810 00
Humboldt	2	1,435 00	3	986 66	1	1,060 00	2	646 25
Imperial			6	907 14	4	608 63	7	887 00
Kern	2	1,332 50	5	839 00	2	1,392 71	5	1,074 28
Kings			2	810 00				
Lake			1	315 00			1	315 00
Los Angeles	57	1,031 86	210	1,000 54	53	1,050 87	227	968 30
Madera	3	825 00	1	925 00	2	706 00	1	950 00
Marin			1	295 00	1	1,425 00		
Mendocino	1	600 00						
Merced							1	1,080 00
Napa			1	1,020 00			1	900 00
Nevada	1	1,033 00	1	1,099 00	1	600 00		
Orange	4	723 75	9	809 86	7	817 85	12	805 41
Riverside	6	1,157 00	10	922 00	4	1,447 00	4	1,244 00
Sacramento	7	1,244 60	11	1,165 19	8	1,238 56	11	1,325 89
San Benito			2	620 00				
San Bernardino	6	878 00	17	809 00	5	1,171 00	12	942 00
San Diego	5	1.092 00	13	649 18	9	695 11	8	1,116 87
San Francisco	19	1,283 00	37	1,015 85	20	1,447 20	69	1,035 83
San Joaquin	7	1,172 00	9	1,295 00	11	864 38	11	1,141 50
San Luis Obispo	1	1,500 00	2	1,410 00	1	1,550 00	4	955 25
San Mateo	1	810 00	8	788 12	1	1,800 00	10	747 27
Santa Barbara	3	1,333 33	14	732 07	2	1,050 00	13	766 92
Santa Clara	4	666 50	6	1,061 79	2	166 00	8	1,049 94
Santa Cruz	3	791 00	3	870 00	1	1,250 00	8	1,283 00
Siskiyou	1	118 00						
Solano					1	1,200 00		
Sonoma	2	1,215 00	2	1.060 00	1	840 00	2	1,250 00
Stanislaus	1	720 00	1	1,000 00	3	810 00	6	863 30
Sutter					1	105 00		
Tehama	1	405 00	1	855 00	1	405 00	1	1,125 00
Trinity								
Tulare	3	1,250 00	6	1,053 33	3	1,200 00	5	967 00
Ventura	1	385 00	2	849 38			2	902 50
Yolo	2	464 50	2	409 50	1	820 00	3	330 00
Yuba			2	875 00			2	810 00
Totals	175	†$1,098 84	453	†$988 87	189	†$1,105 16	506	†$987 28

†Average.

TABLE No. 9.

Statistics of Elementary Schools, Showing Enrollment by Sex and by County, Including Post Graduate Elementary Schools.

Counties	Elementary schools						Postgraduate elementary schools					
	Boys		Girls		Total		Boys		Girls		Total	
	1916-17	1917-18	1916-17	1917-18	1916-17	1917-18	1916-17	1917-18	1916-17	1917-18	1916-17	1917-18
Alameda	22,659	22,450	20,296	21,356	42,955	43,806	-----	-----	-----	-----	-----	-----
Alpine	23	16	12	4	35	20	-----	-----	-----	-----	-----	-----
Amador	788	728	758	700	1,546	1,428	3	-----	4	-----	7	-----
Butte	2,247	2,145	1,973	2,023	4.220	4,168	10	7	13	9	23	16
Calaveras	754	714	723	687	1,477	1,401	-----	5	-----	5	-----	10
Colusa	641	627	612	608	1,253	1,235	-----	-----	2	1	2	1
Contra Costa	3,693	4,088	3,802	3,988	7,495	8,076	-----	-----	-----	-----	-----	-----
Del Norte	291	265	273	263	564	528	1	1	3	2	4	3
El Dorado	567	524	568	519	1,135	1,043	4	4	12	6	16	10
Fresno	9,768	10,401	9,050	9,681	18,818	20,082	-----	-----	-----	-----	-----	-----
Glenn	819	861	791	864	1,610	1,725	8	2	5	2	13	4
Humboldt	3,041	2,926	2 870	2,769	5,911	5,695	12	1	20	2	32	3
Imperial	2,451	2,771	2,250	2,589	4,701	5,360	6	-----	7	1	13	1
Inyo	491	506	444	483	935	989	-----	-----	-----	-----	-----	-----
Kern	3,928	4,235	3.608	3,905	7,536	8,140	-----	-----	2	-----	2	-----
Kings	1,985	1,995	1,783	1,758	3,768	3,753	-----	-----	-----	-----	-----	-----
Lake	460	415	464	440	924	855	2	3	-----	8	2	11
Lassen	668	660	591	638	1,259	1.298	9	5	11	5	20	10
Los Angeles	52,268	58 323	48,244	54,747	100,512	113,070	-----	4	4	6	4	10
Madera	1,041	1,023	1,000	1,007	2,041	2,030	4	-----	1	-----	5	-----
Marin	1,864	1,832	1,688	1,693	3,552	3,525	-----	-----	-----	-----	-----	-----
Mariposa	282	313	239	250	521	563	2	1	3	-----	5	1
Mendocino	2,214	2,116	2,007	1.983	4.221	4,099	10	-----	14	-----	24	-----
Merced	1,993	2,026	1,835	1,889	3.828	3,915	-----	-----	-----	-----	-----	-----
Modoc	596	556	595	563	1,191	1,119	4	10	14	12	18	22
Mono	79	75	81	84	160	159	1	2	7	8	8	10
Monterey	2,021	2,069	1,830	1,965	3,851	4,034	2	-----	11	5	13	5
Napa	1,269	1,299	1,168	1,155	2,437	2,454	-----	-----	-----	-----	-----	-----
Nevada	1,052	1,035	1,019	964	2,071	1,999	-----	-----	-----	-----	-----	-----
Orange	4,375	4,427	4.213	4,253	8 588	8 680	-----	-----	-----	-----	-----	-----
Placer	1,479	1,468	1,371	1,350	2.850	2 818	1	-----	1	-----	2	-----
Plumas	487	514	415	449	902	963	-----	-----	-----	-----	-----	-----
Riverside	3,740	3,556	3.461	3,406	7,201	6,962	1	4	4	-----	5	4
Sacramento	5,903	6,044	5,103	5,531	11,006	11,575	12	9	21	17	33	26
San Benito	634	636	605	607	1,239	1.243	-----	-----	-----	-----	-----	-----
San Bernardino	5,656	5.766	4,993	5,158	10,649	10,924	4	2	13	1	17	3
San Diego	6.546	6.702	6,318	6.459	12,864	13,161	10	8	13	22	23	30
San Francisco	28,279	28.113	25,437	25.849	53.716	53,962	-----	-----	-----	-----	-----	-----
San Joaquin	5,098	5,409	4,657	5,055	9.755	10,464	-----	-----	-----	-----	-----	-----
San Luis Obispo	1 850	1,785	1,665	1,606	3.515	3,391	16	10	24	26	40	35
San Mateo	2,769	2,851	2 534	2,730	5.303	5,581	-----	-----	1	-----	1	-----
Santa Barbara	2.487	2,817	2,269	2.490	4.756	5,307	-----	-----	-----	-----	-----	-----
Santa Clara	7,579	7,337	6,309	6,562	13.888	13,899	2	-----	3	-----	5	-----
Santa Cruz	2.007	2,098	1,768	1,811	3,775	3.909	4	1	4	1	8	2
Shasta	1,499	1.496	1,448	1,430	2,947	2,926	-----	-----	-----	-----	-----	-----
Sierra	180	183	194	194	374	377	6	6	11	6	17	12
Siskiyou	1,674	1,758	1.618	1,653	3,292	3.411	9	-----	9	-----	18	-----
Solano	1.985	2,148	1,812	1,934	3,797	4,082	-----	-----	-----	-----	-----	-----
Sonoma	4,596	4,457	4,085	3,892	8,681	8.349	-----	-----	-----	-----	-----	-----
Stanislaus	3,476	3,688	3,291	3,455	6,767	7,143	-----	-----	-----	-----	-----	-----
Sutter	666	670	627	630	1,293	1,300	-----	-----	-----	-----	-----	-----
Tehama	1,150	1,070	980	942	2,130	2,012	-----	-----	-----	-----	-----	-----
Trinity	269	261	224	236	493	497	3	5	2	4	5	9
Tulare	4,603	4,905	4,206	4,500	8.809	9,405	14	7	23	8	37	15
Tuolumne	764	746	729	684	1.493	1,430	-----	-----	-----	-----	-----	-----
Ventura	2,145	2,263	1,920	2,076	4.065	4,339	4	1	6	-----	10	1
Yolo	1,185	1,169	1,034	1,056	2.219	2,225	-----	-----	4	-----	4	-----
Yuba	777	675	710	651	1,487	1,326	7	4	21	7	28	11
Totals	223,811	232,006	204,570	216,224	428,381	448,230	171	102	293	163	464	265

TABLE No. 9—Continued.

Statistics of Elementary Schools, Showing Total Enrollment of Pupils in Elementary Day and Evening Schools by Grades and Enrollment in Postgraduate Elementary Schools.

Enrolled in elementary schools	1916-17	1917-18
First year—		
Boys	45,667	47,720
Girls	39,765	41,811
Second year—		
Boys	31,314	31,150
Girls	26,520	26,604
Third year—		
Boys	30,000	30,086
Girls	27,090	27,965
Fourth year—		
Boys	28,350	28,709
Girls	26,306	27,294
Fifth year—		
Boys	26,141	27,182
Girls	25,964	25,611
Sixth year—		
Boys	24,346	24,796
Girls	22,374	23,386
Seventh year—		
Boys	19,775	22,378
Girls	19,622	21,520
Eighth year—		
Boys	16,445	20,546
Girls	16,096	20,471
Totals—		
Boys	222,811	233,044
Girls	214,370	214,326
Grand totals	436,481	446,910
Postgraduate Elementary Schools.		
First year—		
Boys	106	57
Girls	206	125
Second year—		
Boys	65	45
Girls	96	78
Totals—		
Boys	171	102
Girls	293	139
Grand totals	464	178

TABLE No. 10.

Statistics of Elementary Schools, Showing Number of Graduates from Elementary and from Postgraduate Elementary Schools, and Average Daily Attendance in Such Schools.

Counties	Number of graduates from								Average daily attendance	
	Elementary schools				Postgraduate elementary schools					
	1916-17		1917-18		1916-17		1917-18			
	Boys	Girls	Boys	Girls	Boys	Girls	Boys	Girls	1916-17	1917-18
Alameda	1,408	1,600	1,305	1,429					34,126	34,948
Alpine	1	1	1						26	19
Amador	44	31	30	71					1,360	1,224
Butte	161	152	121	126					3,561	3,333
Calaveras	50	63	45	40					1,255	1,162
Colusa	42	42	44	40					1,132	1,054
Contra Costa	214	238	225	333					6,698	6,885
Del Norte	20	13	16	18					453	415
El Dorado	49	65	34	53		2			956	847
Fresno	548	657	599	685					16.165	17,003
Glenn	54	57	68	109					1.398	1.430
Humboldt	208	213	180	214					4,858	4,847
Imperial	113	153	156	149					3,583	3,887
Inyo	36	25	25	50					743	782
Kern	145	156	206	201					6,272	6.480
Kings	55	65	68	57					3,172	3,044
Lake	44	52	31	50					754	727
Lassen	30	54	33	36					998	982
Los Angeles	3,582	3,851	3,754	4,082		2			80.129	81,543
Madera	44	65	51	59					1,710	1,683
Marin	120	106	112	119					2 941	2 808
Mariposa	9	11	18	16					408	420
Mendocino	90	182	90	152					3,466	3,351
Merced	80	116	42	131					3,172	3,379
Modoc	46	56	28	38			2	5	935	883
Mono		3	6	5		1		2	115	113
Monterey	161	134	136	155		2		3	3,241	3,263
Napa	100	120	105	112				1	2,156	2,128
Nevada	73	92	58	66					1,781	1.692
Orange	260	261	261	264					7,191	7,065
Placer	104	95	114	123	1	1			2,484	2,365
Plumas	22	34	18	18					651	646
Riverside	262	229	222	237				1	5,637	5 512
Sacramento	394	422	215	271	6	10	1	1	8,868	9,009
San Benito	34	43	46	45					1,043	1,069
San Bernardino	341	414	346	359		2			8,928	8.581
San Diego	406	417	383	468	2	1			10,151	10.127
San Francisco	1,681	1,971	1,757	1,970					42.071	41,822
San Joaquin	241	265	220	320					7,830	8,387
San Luis Obispo	134	153	129	124	4	5			2,912	2,809
San Mateo	177	160	151	188					4,591	4,715
Santa Barbara	122	110	115	122					3,811	4.051
Santa Clara	454	543	410	513					11,122	11,201
Santa Cruz	168	204	142	147				1	3.282	3.009
Shasta	39	35	64	90					2,278	2,212
Sierra	16	13	12	14					338	328
Siskiyou	54	73	62	80					2,727	2,720
Solano	125	155	139	148					3,271	3.344
Sonoma	322	295	307	295					7,126	6.718
Stanislaus	220	308	239	315		3			5,825	6,014
Sutter	43	45	54	55					1.112	1,137
Tehama	77	96	71	94					1,783	1,680
Trinity	16	12	13	15	1	1	3	1	370	364
Tulare	292	310	345	371	3	4		1	7,651	7,735
Tuolumne	45	55	60	65					1,285	1,226
Ventura	82	90	100	135		1			3,221	3,273
Yolo	83	98	84	86					1,956	1,945
Yuba	34	45	30	27					1,225	1,172
Totals	13,715	15,324	13,696	15,555	17	35	6	16	*348,304	*350,568

*Includes postgraduate schools.

TABLE No. 11.

Statistics of Elementary Schools, Showing Average Number of Days Schools Were Actually Open for Year, Number of Visits by School Officers, and Number of Books in School Libraries by Counties.

Counties	Average number of days schools were actually open		Number of visits by county superintendent of schools		Number of visits by school trustees		Number of books in school libraries	
	1916-17	1917-18	1916-17	1917-18	1916-17	1917-18	1916-17	1917-18
Alameda	186	184	548	434	823	962	113,940	110,756
Alpine	166	167	7	6	4	5	1.267	899
Amador	170	168	105	111	97	126	21,702	20,899
Butte	167	155	117	141	207	198	48,147	43 683
Calaveras	165	163	65	66	134	125	23,610	24 530
Colusa	158	160	84	80	89	59	24,963	26,759
Contra Costa	183	182	188	226	283	260	43 883	62.361
Del Norte	176	178	22	25	22	37	7,882	8,102
El Dorado	157	150	67	105	132	147	25.186	24.413
Fresno	163	160	654	830	1,140	963	118,603	103.215
Glenn	163	159	133	123	50	75	26,494	27.343
Humboldt	173	172	225	238	533	530	55,477	54,989
Imperial	167	166	180	202	396	434	13,285	12,650
Inyo	164	157	46	45	94	140	6 189	2.981
Kern	160	158	347	257	536	379	63,554	54,196
Kings	167	156	166	139	246	245	11.240	13 843
Lake	153	149	50	47	74	83	16.179	15,919
Lassen	152	149	57	56	134	123	15,438	13.899
Los Angeles	169	167	5,675	5,868	2,209	2,311	239.486	442,025
Madera	166	158	87	68	213	142	18 966	18,638
Marin	190	184	288	343	273	234	48.594	51.645
Mariposa	153	150	33	57	71	87	12.220	13,041
Mendocino	155	156	261	250	415	339	63.044	58 030
Merced	157	156	120	130	213	188	52,654	54.298
Modoc	149	152	61	73	102	127	21,323	21.486
Mono	167	172	12	14	20	11	6,548	6.571
Monterey	173	174	224	266	413	394	84.196	82,397
Napa	178	180	134	135	189	199	29 588	29 313
Nevada	162	159	85	83	98	137	33,611	32,918
Orange	168	169	204	235	293	327	84.473	84 117
Placer	159	156	197	200	275	252	44 380	45.603
Plumas	158	158	39	42	95	80	12,215	12.560
Riverside	178	158	189	176	743	583	42,391	45,841
Sacramento	169	168	201	239	352	368	23,043	16,681
San Benito	166	166	279	349	129	152	16.797	18 820
San Bernardino	175	161	320	328	734	623	73,859	95,721
San Diego	162	169	457	240	1.138	904	91,572	92,303
San Francisco	193	194	4,677	3,193	1,272	2,008	104.074	136.818
San Joaquin	168	166	154	160	391	390	66.512	71,237
San Luis Obispo	158	157	224	284	311	423	55,005	56.669
San Mateo	188	189	273	268	548	279	46.421	50.062
Santa Barbara	191	177	257	306	344	301	50,626	51,716
Santa Clara	174	172	624	561	765	828	114.978	115,010
Santa Cruz	181	176	235	248	196	228	39,350	40,005
Shasta	147	147	151	144	205	221	49 146	47,215
Sierra	158	157	18	21	21	41	10.804	10,916
Siskiyou	152	152	154	141	301	323	51,648	36 979
Solano	174	172	201	178	184	157	37,514	39,081
Sonoma	173	174	292	273	536	491	106,478	172,244
Stanislaus	172	171	350	352	307	266	57,313	63.671
Sutter	165	165	82	54	75	68	26,622	27,932
Tehama	153	153	124	104	171	139	27,300	24.977
Trinity	147	147	35	36	77	79	7,451	6.136
Tulare	167	164	279	279	467	391	117,491	117.330
Tuolumne	160	158	60	61	73	79	15.964	16,275
Ventura	179	173	166	170	108	125	43,509	46,220
Yolo	170	165	218	174	178	91	21,090	35,247
Yuba	152	150	64	62	71	88	18,614	18,839
Totals	†166	164	20,565	19,296	19,570	19,365	2,763,909	3,028,054

†Average.

STATISTICS OF ELEMENTARY SCHOOLS

Showing Resources of State School Fund Apportioned for the School Years Ending June 30, 1917, and June 30, 1918.

Table No. 12 attempts to give the apportionment of state school money apportioned during the two-year period. The first apportionment for the school year 1916-17 was made on September 13 and was apportioned from money accumulated for that school year at the rate of $250 per teacher. This apportionment is continued in February, 1917, and in July, 1917. This is really the apportionment for the school year. But on July 5, 1916, an apportionment from money accumulated during the previous year was made in the amount of 67 cents per pupil on attendance on June 30, 1915. This same plan is followed on July 3, 1917. This July money is money accumulated during the previous school year and belongs to that year, hence must be apportioned as the money of that school year is apportioned. This money may be used for paying teachers' salary of the previous school year. In order to show exactly the amount of money apportioned for school year, these tables are made up on the apportionment for the school year beginning in September and ending in July. The reports of the county superintendents, however, must be made up closing June 30, hence their reports show the money received for July, September and February; hence the plan of these tables.

Apportionment for School Year Ending June 30, 1917.

September 13, 1916 ($250 per teacher)	$2,993,750 00
February 11, 1917 (per pupil on attendance--$7 49)	2,553,618 13
July 3, 1917 (per pupil on attendance------ 63)	214,790 31
Totals, $250 per teacher and $8.12 per pupil on attendance	$5,762,158 44

Apportionment for School Year Ending June 30, 1918.

September 1, 1917 ($250 per teacher)	$3,052,250 00
February 20, 1918 (per pupil on attendance--$7 56)	2,633,178 24
July 2, 1918 (per pupil on attendance------- 67)	233,363 68
Totals, $250 per teacher and $8.23 per pupil on attendance	$5,918,791 92

Resources of State School Money.

The letter of State Controller dated July 2, 1917, will show resources of school money for the school year ending June 30, 1917, and including the July apportionment.

SACRAMENTO, CALIFORNIA, July 2, 1917.

HON. EDWARD HYATT, *Superintendent of Public Instruction,*
Forum Building, Sacramento, California.

DEAR SIR: There is in the State School Fund, June 30, 1917, subject to apportionment, $247,451.76, as per following statement:

July 1, 1916:	
Balance on hand	$223,193 31
Received from polls	3,151 00
Received interest on bonds	360,169 03
Received interest on lands	34,640 32
Received interest on land foreclosure	46 00
Received one-half dairy fines	1,269 22
Received University of California	9 00
Received transfer account, $15.00	5,114,145 00
Received transfer inheritance taxes	250,000 00

Received canceled warrants		17,997 50
Received escheats by order of court		1,523 86
		$6,006,144 24
Disbursements:		
To counties	$5,766,501 65	
Restitution interest	1,313 79	
Restitution interest foreclosure	235 82	
Reissue canceled warrants	18,004 74	
		5,786,056 00
		$220,088 24
Less Sierra County—not presented		2,636 48
Amount subject to apportionment June 30, 1917		$217,451 76

The bonds held in trust for State School Fund on June 30, 1917, amount to $7,853,524.92.

Yours very truly,

JOHN S. CHAMBERS, Controller.
By D. A. MOULTON, Deputy.

The letter of the State Controller, dated July 1, 1918, will show the resources of the state school money for the school year closing June 30, 1918, and including the July apportionment, which is given in Table 12 of this report.

Letter of State Controller.

SACRAMENTO, CALIFORNIA, July 1, 1918.

HON. EDWARD HYATT, *Superintendent of Public Instruction,*
Forum Building, Sacramento, California.

DEAR SIR: The amount of bonds in School Land Fund held in trust for schools is $7,300,062.42, on June 30, 1918.

There is in the State School Fund as of June 30, 1918, $235,384.34, subject to apportionment and received from the following sources:

July 1, 1918:		
Balance on hand		$220,088 24
Receipts from polls		2,249 05
Receipts from interest on bonds		354,582 90
Receipts from interest on lands		64,993 30
Receipts from interest on lands, delinquent penalties		317 47
Receipts, one-half dairy fines		382 17
Receipts, University of California		6 00
Receipts, escheated estates		21,689 51
Receipts, refund Imperial County		250 00
Receipts, transfer ($15.00)		5,224,560 00
Receipts, transfer (inheritance)		250,000 00
Total receipts		$6,139,118 64
Disbursements:		
To counties	$5,874,043 87	
Restitution interest	879 27	
		5,874,923 14
Balance		$264,195 50
Less Santa Barbara County—not delivered		28,811 16
Subject to apportionment		$225,384 34

Yours very truly,

JOHN S. CHAMBERS, Controller.
By D. A. MOULTON, Deputy.

TABLE No. 12.

Statistics of Elementary Schools, Showing Amount of Money Apportioned by the State to the Elementary Schools Within School Year Ending June 30, 1916, by Counties.

Counties	July 5, 1916, rate per pupil 67 cents*	Sept. 13, 1916, $250 teacher basis†	Feb. 14, 1917, attendance June 30, 1916	Total within school year 1916-17
Alameda	$21,584 05	$259,677 50	$247,289 84	$528,551 39
Alpine	16 08	750 00	187 25	953 33
Amador	832 14	14,705 00	9 886 80	25,423 94
Butte	2,509 15	37,250 00	27,698 02	67 457 17
Calaveras	850 23	15 897 50	9,497 32	26,245 05
Colusa	669 33	12.925 00	8,239 00	21.833 33
Contra Costa	3,854 51	50,572 50	46,183 34	100,610 35
Del Norte	283 41	5,500 00	3.422 93	9 206 34
El Dorado	607 02	14,375 00	6 651 12	21,633 14
Fresno	10,303 26	132,252 50	118,641 60	261,197 36
Glenn	920 58	15,005 00	10,133 97	26,059 55
Humboldt	3,167 09	49,250 00	36,573 67	88 990 76
Imperial	2,103 13	26,750 00	23,758 28	52 611 41
Inyo	459 62	8,000 00	5,580 05	14 039 67
Kern	3,624 70	54,167 50	41,973 96	99,766 16
Kings	1,907 49	25.312 50	22,747 13	49.967 12
Lake	531 98	11,582 50	5,924 59	18,039 07
Lassen	600 32	13,500 00	7.272 79	21.373 11
Los Angeles	50,855 01	614,110 00	582,969 17	1,247,934 18
Madera	1,009 02	18,025 00	12.313 56	31 347 58
Marin	1,867 96	25,720 00	21,773 43	49,361 39
Mariposa	257 95	7,250 00	2,988 51	10,496 46
Mendocino	2,171 47	43,000 00	25,818 03	70.989 50
Merced	1,996 60	30.122 50	23.189 04	55,308 14
Modoc	644 54	13,250 00	7,325 22	21.219 76
Mono	75 04	3,000 00	958 72	4,033 76
Monterey	1,995 93	35,080 00	23.615 97	60,691 90
Napa	1,458 59	22,445 00	16,230 83	40,134 42
Nevada	1,230 79	20 500 00	13.751 64	35.482 43
Orange	4,659 85	54,640 00	52,894 38	112,194 23
Placer	1,567 13	23.405 00	18,290 58	43,262 71
Plumas	401 33	9,000 00	4.501 49	13,902 82
Riverside	3,642 79	50 030 00	41,337 31	95 010 10
Sacramento	5,617 28	74,455 00	65,425 15	145,497 43
San Benito	638 51	12,157 50	7,460 04	20 256 05
San Bernardino	5,607 90	77.037 50	65,986 90	148 632 30
San Diego	7,061 80	94,682 50	76,727 56	178,471 86
San Francisco	27,548 39	329 750 00	313,950 84	671,249 23
San Joaquin	4,733 55	66,315 00	57,650 53	128 699 08
San Luis Obispo	1,826 42	33,500 00	21 698 53	57,024 95
San Mateo	2,716 18	35,500 00	32 386 76	70,602 94
Santa Barbara	2,192 91	33.050 00	26.222 49	61.465 40
Santa Clara	7,164 31	88 547 50	83,693 26	179.405 07
Santa Cruz	2,129 26	30 465 00	24.522 26	57 116 52
Shasta	1,522 24	32,000 00	17.219 51	50,741 75
Sierra	264 65	5,000 00	2.636 48	7.901 13
Siskiyou	1,695 10	33.000 00	19.129 46	53.824 56
Solano	2,078 34	29,480 00	23,705 85	55 264 19
Sonoma	4,669 23	68,780 00	54,152 70	127,601 93
Stanislaus	3,657 53	46.187 50	42.311 01	92.156 04
Sutter	754 42	12,250 00	8,583 54	21.587 96
Tehama	1,381 71	23.820 00	14,485 66	39,687 37
Trinity	233 83	6,750 00	2,733 85	9,717 68
Tulare	4.844 77	68,197 50	56,130 06	129,172 33
Tuolumne	885 74	13,500 00	9 804 41	24.190 15
Ventura	1,989 23	29,282 50	23,563 54	54,835 27
Yolo	1,214 71	18,492 50	14,665 42	34,372 63
Yuba	783 90	14,250 00	9,152 78	24,186 68
Totals	$221,870 00	$2,993,500 00	$2,553,618 13	$5,768,988 13

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*Apportionment based on 331,000 average attendance reported June 30, 1915.

†Teacher basis made up on average attendance of each district reported June 30, 1916.

TABLE No. 12—Continued.

Statistics of Elementary Schools, Showing Amount of Money Apportioned by State to Elementary Schools Within School Year Ending June 30, 1918, by Counties.

Counties	July 3, 1917, rate per pupil 63 cents*	$250 Sept. 1, 1917, on teacher basis June 30, 1917†	Apportioned Feb. 20, 1918, on attendance‡	Total apportionment within year	Apportioned July 2, 1918, on attendance‡
Alameda	$20,800 08	$267,920 00	$257,992 56	$546,712 64	$22,864 42
Alpine	15 75	750 00	196 56	962 31	17 42
Amador	831 60	15,030 00	10,281 60	26,203 20	911 20
Butte	2,329 74	35,750 00	26,921 16	65,000 90	2,385 87
Calaveras	798 84	15,357 50	9,487 80	25,644 14	840 85
Colusa	693 00	13,012 50	8,557 92	22,263 42	758 44
Contra Costa	3,884 58	54,580 00	50,636 88	109,101 46	4,487 66
Del Norte	287 91	5.250 00	3,424 68	8.962 59	303 51
El Dorado	559 44	14,985 00	7,227 36	22,771 80	640 52
Fresno	9,979 20	134,510 00	122,207 40	266,696 60	10,830 55
Glenn	852 39	15,457 50	10,568 88	26 878 77	936 66
Humboldt	3,076 29	49,500 00	36.726 48	89,302 77	3,254 86
Imperial	1,998 36	29,500 00	27,087 48	58,585 84	2.400 61
Inyo	469 35	8,750 00	5,617 08	14.836 43	497 81
Kern	3,530 52	59,250 00	47,416 32	110,196 84	4,202 24
Kings	1,913 31	26,470 00	23,980 32	52,363 63	2,125 24
Lake	498 33	11,332 50	5,700 24	17 531 07	505 18
Lassen	611 73	13,750 00	7,544 88	21,906 61	668 66
Los Angeles	49,034 79	632,622 50	605,775 24	1,287,432 53	53,686 43
Madera	1,035 72	18,527 50	12,927 60	32,490 82	1,145 70
Marin	1,831 41	26,457 50	22,233 96	50,522 87	1.970 47
Mariposa	251 37	8,455 00	3,084 48	11,790 85	273 36
Mendocino	2,171 61	42,750 00	26,202 96	71,124 57	2.322 22
Merced	1,950 48	30,172 50	23,980 32	56,103 30	2,125 24
Modoc	616 14	13,750 00	7,068 60	21,434 74	626 45
Mono	80 64	3,000 00	869 40	3,950 04	77 05
Monterey	1,986 39	36 805 00	24,501 96	63,293 35	2.171 47
Napa	1,365 21	21,955 00	16,299 36	39,619 57	1,444 52
Nevada	1,156 68	20,500 00	13,464 36	35,121 04	1.193 27
Orange	4,449 06	55,397 50	54,363 96	114,210 52	4.817 97
Placer	1,538 46	24,472 50	18,779 04	44,790 00	1,664 28
Plumas	378 63	9,250 00	4,921 56	14,550 19	436 17
Riverside	3,476 97	49,327 50	42,615 72	95.420 19	3,776 79
Sacramento	5,503 05	74,867 50	67,042 08	147,412 63	5.941 56
San Benito	627 48	12,687 50	7,885 08	21,200 06	698 81
San Bernardino	5,550 30	77,782 50	37,495 68	150,828 48	5.981 76
San Diego	6,453 72	94,390 00	76,741 56	177,585 28	6,801 17
San Francisco	26,407 08	331,250 00	318,056 76	675,713 84	28,187 57
San Joaquin	4,849 11	67.815 00	59,194 80	131.858 91	5,246 10
San Luis Obispo	1,825 11	33,500 00	22,014 72	57,339 83	1,951 04
San Mateo	2,724 12	37,250 00	34,707 96	74 682 08	3,075 97
Santa Barbara	2,205 63	34,535 00	28,811 16	65,551 79	2 553 37
Santa Clara	7,039 62	88,492 50	84,082 32	179,614 44	7,451 74
Santa Cruz	2,062 62	30,765 00	24,811 92	57,639 54	2,198 94
Shasta	1,448 37	32,000 00	17,221 68	50.670 05	1,526 26
Sierra	221 76	4,750 00	2,555 28	7,527 04	226 46
Siskiyou	1,609 02	34,250 00	20,616 12	56 475 14	1.827 09
Solano	1,993 95	29,987 50	24,728 76	56,710 21	2.191 57
Sonoma	4,554 90	68.292 50	53,872 56	126,719 96	4.774 42
Stanislaus	3,558 87	48,667 50	44,037 00	96.263 37	3.902 75
Sutter	721 98	12,250 00	8,406 72	21,378 70	745 64
Tehama	1,218 42	22,342 50	13,479 48	37,040 40	1,194 61
Trinity	229 95	7,000 00	2,797 20	10,027 15	247 90
Tulare	4,721 22	68,535 00	57,841 56	131,097 78	5.126 17
Tuolumne	824 67	13,575 00	9,714 60	24,114 27	860 95
Ventura	1,981 98	28.945 00	24 350 76	55,277 74	2,158 07
Yolo	1,233 54	19,162 50	14,787 36	35,183 40	1.310 52
Yuba	769 86	14,500 00	9,261 00	24.530 86	820 75
Totals	$214,790 31	$3,052,250 00	$2,633,178 24	$5,900,218 55	$233,363 68

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*Apportioned on attendance reported June 30, 1916 (340,937).

†Apportioned on teacher basis estimated on average attendance of each school reported June 30, 1917.

‡Attendance reported June 30, 1917.

TABLE No. 13.

Statistics of Elementary Schools, Showing Receipts From All Sources Within the School Year Ending June 30, 1917, by Counties.

Counties	Balance on hand June 30, 1916	Total receipts from state	Total receipts from county	Total receipts from district			Total receipts
				From special taxes	From sale of bonds	From miscellaneous sources	
Alameda	$193,484 61	$528,589 19	$641,477 82	$741,507 42	$118,231 85	$9,071 18	$2,232,362 07
Alpine	1,050 77	953 33	1,533 40	-----	-----	-----	3,537 50
Amador	14,850 42	25,419 03	27,356 42	4,456 62	-----	74 45	72,156 94
Butte	25.453 30	67,215 23	76,186 57	29,611 61	10,449 05	3,818 57	212,734 33
Calaveras	19,936 52	26,245 05	30,603 45	-----	-----	13 50	76,798 52
Colusa	17,336 64	21,833 33	30,501 51	4,687 62	92,807 50	1,126 91	168 293 51
Contra Costa	83,984 54	100,558 21	162,725 00	67,419 61	67,594 00	799 70	483,081 06
Del Norte	7,281 68	9,210 84	12,883 75	487 88	-----	-----	29,864 15
El Dorado	9.839 82	21,979 85	14,790 00	481 67	37,934 37	258 77	85,284 48
Fresno	217,749 80	259,122 50	285,453 00	159,666 24	65,496 20	15,953 71	1,003,441 45
Glenn	22,405 07	26,568 01	37,548 00	6,582 93	10,547 77	67 03	103,718 81
Humboldt	87,160 50	89,044 00	112,945 00	12,109 05	-----	66 59	301,325 14
Imperial	42,478 35	52,611 41	74,712 55	54,182 41	26,254 00	2,825 73	253,064 45
Inyo	6,944 79	14,036 99	16,148 00	4,771 73	10,289 00	953 18	53,143 69
Kern	96,093 39	100,255 00	124,365 50	112,404 13	132,162 51	3,150 06	568,430 59
Kings	25,907 35	50,137 90	71,233 50	11,724 18	-----	311 96	159,314 89
Lake	4,017 47	18,038 51	13,847 71	1,355 69	-----	493 11	37,752 49
Lassen	10,722 02	21,409 70	30,792 50	2,738 00	1,500 00	21 10	67,183 32
Los Angeles	1,780,700 29	1,248,595 91	1,188,107 69	2,091,554 56	399,411 10	280,425 98	6,988,795 53
Madera	16,814 35	31,015 00	51,294 00	8,349 71	1,207 00	2,691 92	111.371 98
Marin	26,365 18	49,364 25	54,198 65	46,991 06	5,141 67	-----	182,060 81
Mariposa	3,786 67	10,496 46	11,469 50	520 25	-----	410 60	26,683 48
Mendocino	48,582 01	72,062 33	52,253 14	4,019 47	1,000 00	5,199 26	183 116 21
Merced	29,383 46	55,304 79	57,405 18	19,767 36	97,358 76	1,361 88	260,581 43
Modoc	18,380 25	21.255 40	26,711 00	1,014 06	4,441 25	225 52	72,027 48
Mono	3,756 96	5,391 55	7,245 47	-----	-----	127 99	16.521 97
Monterey	31,152 73	61,190 35	93,405 49	17,607 93	8,876 08	864 46	213,097 04
Napa	22,904 87	40,134 42	44,914 41	10,747 01	3,109 80	1,510 32	123,320 83
Nevada	10,064 37	35,496 36	36,278 43	325 72	-----	3,110 68	85,275 56
Orange	83,267 40	111,776 00	127,395 00	86,766 01	31,629 17	2,140 91	442.974 49
Placer	42,130 44	43,262 71	44,068 31	16,160 91	8,821 00	890 05	155,333 42
Plumas	16,991 78	13,871 12	16,995 53	1,398 75	-----	31 05	49,288 23
Riverside	86,833 28	98,369 00	89,351 00	83,720 31	42,708 00	2,364 35	403.345 94
Sacramento	221,301 94	145,497 43	201,814 40	195,951 52	12,495 00	35,007 44	812,067 73

San Benito	13,570 20	20,245 02	21,636 69	381 92		1,655 00	57,488 83
San Bernardino	133,690 44	148,815 00	138,528 75	148,447 32	700 00	10,223 06	580,404 57
San Diego	88,855 34	178,471 86	156,143 00	244,194 79	15,134 35	42,135 37	724,934 71
San Francisco	235,184 75	670,107 92	1,712,825 30			99,498 27	2,717,616 24
San Joaquin	90,422 88	128,659 84	120,543 00	154,464 40	23,861 40	5,876 96	523,828 48
San Luis Obispo	45,687 25	58.543 20	45,804 30	28,333 42	28,325 75	3,726 77	210,420 69
San Mateo	87,953 99	70,752 80	99,903 10	39,029 48	40,508 50	193 56	338,341 43
Santa Barbara	34,446 82	61,403 82	82,074 30	42,703 00	5,140 00	854 58	226,622 52
Santa Clara	161,710 97	179,546 62	204,875 75	85,108 13	93,233 07	4,526 03	729,000 57
Santa Cruz	29,057 10	57,140 06	72,747 24	29,887 31		2,186 55	191,018 26
Shasta	21,970 31	50,739 07	55,375 84		1,026 00	1,899 20	131,010 42
Sierra	5,052 81	7,901 13	10,398 21	518 85			23,871 00
Siskiyou	21,733 84	53,685 80	39,858 00	10,745 72	13,877 71	477 46	140,378 53
Solano	53,350 19	55,264 19	60,172 50	27,064 24		1,496 76	197,347 88
Sonoma	72,837 26	126,547 40	96,480 10	51,163 17	35,986 94	202 21	383,217 08
Stanislaus	120,779 93	92,156 04	91,715 34	43,817 44		14,263 76	362,732 51
Sutter	28,276 39	21,587 96	23,631 20	3,012 70	22,566 42	129 35	99,204 02
Tehama	36,892 03	41,409 30	46,921 20	7,650 00	16,554 75	295 52	149,722 80
Trinity	6,783 75	9,734 72	9,925 10	690 73			27,134 30
Tulare	102,919 76	129,464 20	159,572 70	52,758 61	148,085 69	22,939 72	615,740 68
Tuolumne	10,420 70	24,092 29	21,891 44	1,483 28		134 21	58,021 92
Ventura	88.855 19	54.835 27	66,101 60	33,687 94	10,445 64	1,599 95	255,525 59
Yolo	30.244 17	34,372 63	49,489 20	5,726 04	32,304 00	3,655 75	155,791 79
Yuba	8,860 19	25,170 00	24,438 00	30,932 16		331 75	89,732 10
Totals	$4,858,669 28	$5,776,957 30	$7,279,062 74	$4,840,882 07	$1,677,215 30	$593,669 75	$25,026,456 44

TABLE No. 13.—Continued.

Statistics of Elementary Schools, Showing Receipts From All Sources Within the School Year Ending June 30, 1918, by Counties.

Counties	Balance on hand June 30, 1917	Total receipts from state	Total receipts from county	Total receipts from district from taxes				Total receipts
				Taxes for maintenance	Special taxes for buildings	Taxes from sale of bonds	Miscellaneous sources	
Alameda	$108,321 38	$547,357 09	$639,862 39	$652,211 52	$230,724 53	--------	$26,238 52	$2,204,715 43
Alpine	990 38	962 31	1,783 92	--------	--------	--------	86 70	3,823 31
Amador	16,813 23	26,226 16	26,540 00	6,578 17	308 07	--------	1,058 82	77,524 45
Butte	26,401 65	64,905 51	78,088 02	29,876 25	--------	--------	2,375 96	201,647 39
Calaveras	20,896 29	25,644 14	26,571 36	--------	416 56	--------	936 35	74,464 70
Colusa	98,770 05	22,262 16	33,785 84	4,484 85	--------	--------	1,379 40	160,682 30
Contra Costa	99,772 37	109,037 26	166,398 08	79,353 17	20,415 89	18,953 34	1,811 03	495,741 14
Del Norte	8,963 26	8,958 22	13,706 15	--------	1,090 87	--------	73 65	32,792 15
El Dorado	7,900 26	22,745 42	14,580 70	--------	--------	--------	177 00	45,403 38
Fresno	261,591 43	280,039 00	273,406 50	136,001 30	12,591 48	41,685 91	11,829 58	1,017,145 20
Glenn	32,370 54	26,641 50	38.606 00	7,359 09	1,745 86	5,000 00	610 00	112,332 99
Humboldt	78,642 50	88,408 00	117,792 00	27,416 77	--------	--------	926 47	313,185 74
Imperial	26,823 07	58,335 84	75,638 58	60,032 13	21,376 09	29,650 75	3,951 90	275,808 36
Inyo	8,807 30	14,836 43	19,383 28	5,886 04	--------	7,174 50	601 32	56,688 87
Kern	113,991 98	110,193 06	147,047 00	107,797 60	29,410 81	14,882 75	3,836 13	527,159 33
Kings	35,736 47	52,416 60	70,977 00	13,251 57	--------	--------	73 02	172,454 66
Lake	5,037 28	17,538 74	14,094 21	593 35	538 82	--------	167 38	37,969 78
Lassen	14,382 41	22,016 03	33,389 30	2,282 33	--------	--------	--------	72,070 07
Los Angeles	789,894 29	1,287,128 64	1,273,935 61	2,258,513 26	299,967 40	181,775 60	315,870 60	6,407,085 40
Madera	16,567 00	32,307 50	52,568 00	8,413 88	5,065 39	--------	8,241 24	123,163 01
Marin	24,586 46	50,522 87	58,339 27	42,564 41	1,680 17	2,556 15	150 00	180,399 33
Mariposa	3,735 58	11,790 85	14,106 00	57 49	347 33	14,060 50	1,275 95	45,373 70
Mendocino	46,801 99	71,147 75	52,043 60	2,061 69	1,052 63	--------	2,392 37	175,500 03
Merced	92,466 04	56,103 30	58,776 30	28,246 69	--------	12,134 96	13,342 31	261,069 60
Modoc	17,665 97	21,879 80	26,784 70	2,061 40	--------	5,072 75	130 70	73,595 32
Mono	1,207 25	3,950 04	8,295 26	--------	--------	--------	4,606 49	18,059 04
Monterey	50,671 84	63,270 67	93,971 00	14,851 36	--------	3,180 00	651 42	226,596 29
Napa	29,254 47	39,619 57	45,589 81	8,300 00	5,000 87	2,075 92	561 35	130,401 99
Nevada	11,228 15	35,118 18	37,067 00	939 13	--------	--------	2,802 92	87,155 38
Orange	26,634 95	114,691 96	135,231 00	99,144 20	2,133 87	--------	1,058 55	378,894 53
Placer	27,998 90	44,790 00	47,808 48	9,968 52	--------	--------	816 32	131,382 22
Plumas	13,440 82	14,556 44	19,099 29	672 48	--------	--------	523 05	48,292 08
Riverside	69,700 47	92,915 00	85,214 50	82,401 46	5,523 12	60,108 70	3,194 16	399,057 41
Sacramento	205,272 05	147,412 63	238,102 59	177,802 75	45,455 35	15,510 75	7,459 16	837,015 28

San Benito	12,518 71	21,271 39	23,666 66	1,491 96		2,430 20	50 08	61,429 00
San Bernardino	99,696 16	150,890 50	136,419 59	122,268 76	42,653 95	16,777 50	3,736 77	572,443 23
San Diego	124,321 29	177,585 28	155,122 87	224,483 62	12,955 90	6,726 63	21,404 53	722,600 12
San Francisco	60,687 62	675,713 84	181,577 26				572,352 94	2,490,331 66
San Joaquin	85,450 26	132,394 91	126,109 60	167,723 11	39,637 57		2,249 14	553,564 59
San Luis Obispo	26,753 07	57,241 40	47,908 00	27,851 64	5,600 19	1,530 00	1,863 51	168,747 81
San Mateo	58 999 45	74,680 82	110,040 30	54,090 72		75,955 00	296 46	374,062 75
Santa Barbara	36,369 05	65,780 45	101.805 18	38,121 00	14,844 00		456 41	257,376 09
Santa Clara	89,359 96	179,615 70	207,007 25	92,214 83		1,031 00	1,769 67	570,998 41
Santa Cruz	23,028 58	57,700 15	71,058 00	28,852 48			2,226 83	182,866 04
Shasta	25,030 06	50,609 14	56,765 30	925 39		3,572 00	1,586 32	138,488 21
Sierra	7,208 76	7,527 04	10,347 25	334 64			128 90	25,546 59
Siskiyou	31,576 35	56,676 21	50,951 95	10,438 64	1,606 83		3,060 83	154,310 81
Solano	22,635 71	56,710 21	62,673 00	28,841 81	9,565 72	38,930 72	4,197 76	223,554 93
Sonoma	76,511 39	126,072 40	112,411 63	59,549 09			436 67	374,981 18
Stanislaus	85,957 71	96,263 37	103,204 94	56,281 17	5,935 10	28,000 00	3,949 90	379,592 19
Sutter	22,174 48	21,956 94	29,476 00	2,445 27			647 57	76,700 26
Tehama	45,704 87	37,653 11	63,547 00	842 28		6,064 05		153,811 31
Trinity	8,107 61	10,024 78	10,955 52		137 54		571 50	29.796 95
Tulare	140,740 52	131,179 05	159,740 59	55,284 28	887 25	47,691 18	19,364 31	554,887 18
Tuolumne	9,277 51	24,846 66	23,526 14	1,762 03			786 45	60,198 79
Ventura	41,232 62	55,279 74	69,264 00	36,522 79	6,566 22	20,378 00	847 54	230,090 91
Yolo	56,061 48	35,183 40	55,148 15	9,943 00		30,722 00	1,301 04	188,359 07
Yuba	9,439 85	24,530 86	28,269 83	14,799 76			262 90	77,303 20
Totals	$3,592,181 15	$5,913,116 02	$7,035 578 75	$4,904,191 13	$825,235 38	$693,630 86	$1,062,757 85	$24,026,691 14

TABLE No. 14.

Statistics of Elementary Schools, Showing Expenditures for All Purposes for School Year Ending June 30, 1917.

Counties	Salaries of teachers	Supplies, rents, repairs, janitors, etc.	Sites, buildings and furniture	Library books	Apparatus	Total expenditures	Balances on hand June 30, 1917
Alameda	$1,388,452 74	$416,246 78	$304,086 31	$8,183 44	$7,071 43	$2,124,040 70	$108,321 37
Alpine	2,065 00	454 95	------------	42 99	------------	2,562 94	974 56
Amador	41,878 37	9,253 28	2,461 33	1,536 17	214 50	55,343 71	16,813 23
Butte	125,200 71	45,044 22	11,503 82	3,949 04	635 66	186,333 45	26,400 88
Calaveras	43,581 75	6,783 25	5,746 43	1,113 61	------------	57,225 04	19,573 48
Colusa	42,408 17	12,193 79	12,277 28	1,765 25	115 63	68,755 12	99,538 39
Contra Costa	219,434 64	65,062 84	94,230 24	3,685 55	------------	382,413 27	100.667 79
Del Norte	15,465 00	4,096 47	445 52	626 63	267 27	20,900 89	8,963 26
El Dorado	35,894 50	4,039 42	2,530 46	624 68	221 06	43,310 12	41,974 36
Fresno	503,515 39	159,412 53	69,301 09	7,328 50	2,292 51	741,850 02	261,591 43
Glenn	50,732 00	15,606 50	3,306 09	1,335 40	306 55	71,286 54	32,432 27
Humboldt	169.846 65	45,029 02	4,090 40	3,384 59	331 98	222,682 64	78,642 50
Imperial	130,343 95	34,972 55	58,372 04	2,358 06	174 35	226,220 95	26.843 50
Inyo	26,354 22	6,390 29	10.967 28	620 85	3 75	44.336 39	8,807 30
Kern	229.480 69	77,667 07	142,327 86	2,823 70	1,708 79	454,008 11	114,422 48
Kings	89,885 30	26.062 77	4,904 87	2,576 11	149 27	123,578 32	35,736 57
Lake	27,450 67	4,838 44	------------	466 00	55 25	32.810 36	4,942 13
Lassen	39,694 73	9,451 82	2,313 04	1,201 33	39 99	52,700 91	14.482 41
Los Angeles	3,840,928 60	1,382,305 46	939.200 22	29,261 22	7,027 27	6,198,722 77	790,072 76
Madera	65,846 90	20,665 39	6,164 10	2,277 39	------------	94,953 78	16,418 20
Marin	110,571 67	27.696 17	16,477 28	1,921 99	832 24	157,499 35	24,561 46
Mariposa	18,201 35	3,389 04	431 49	760 88	------------	22,782 76	3,900 72
Mendocino	106,908 36	23,021 82	3,844 71	2,115 97	423 28	136,314 14	46,802 07
Merced	99,070 87	34,154 09	27,948 79	3,502 02	425 63	165,101 40	95,480 03
Modoc	36,974 00	7,837 12	5,373 51	976 98	775 34	51,936 95	20,090 53
Mono	8,755 00	1,621 34	------------	387 17	------------	10,763 51	5,758 46
Monterey	114,931 19	23,544 75	20,350 17	2,588 16	1,010 93	162,425 20	50,671 84
Napa	65,546 47	20,915 00	5,839 03	1,069 01	696 85	94,066 36	29,254 47
Nevada	60,330 25	12,011 76	673 85	915 20	116 35	74.047 41	11,228 15
Orange	233,000 93	91,259 13	84,186 24	3,643 24	4,250 00	416,339 54	26 634 95
Placer	74,068 71	18,392 84	32,834 18	1,961 75	25 00	127,282 48	28,050 94
Plumas	24,930 00	8,750 73	1,379 37	1,455 60	901 63	37,417 33	11,870 90
Riverside	190,954 11	82,527 65	56,247 16	3,485 40	281 50	333.495 82	69,850 12
Sacramento	445,113 19	112,960 53	41,169 58	7,285 88	266 50	606,795 68	205,272 05

San Benito	34,726 26	7,694 25	1,766 97	782 64	-----	44,970 12	12,518 71
San Bernardino	329,502 03	103,985 96	38,287 79	6,379 38	2,553 25	480,708 41	99,696 16
San Diego	411,132 62	133,163 38	49,308 11	6,944 68	64 63	600,613 42	124,321 29
San Francisco	1,530,329 00	345,412 57	656,072 06	4,600 00	200 00	2,536,613 63	181,002 61
San Joaquin	278,333 45	88,722 31	67,578 82	3,169 79	639 81	438,444 18	85,384 30
San Luis Obispo	105,718 52	28,444 12	46,428 33	1,664 55	388 17	182,643 69	27,777 00
San Mateo	157,038 93	46,113 35	75,007 06	2,267 67	1,323 18	281,750 19	56,591 24
Santa Barbara	135,395 99	45,014 24	7,481 46	2,065 22	-----	189,986 91	36,635 61
Santa Clara	365,221 31	79,839 81	187,290 41	6,726 65	683 18	639,761 36	89,239 21
Santa Cruz	123,665 41	35,492 90	5,960 61	2,370 71	477 65	167,967 28	23,050 98
Shasta	81,665 43	20,615 56	1,430 78	1,073 10	351 52	105,136 39	25,874 03
Sierra	13,639 02	2,507 30	58 36	471 78	-----	16,676 46	7,194 54
Siskiyou	85,545 74	17,315 53	6,141 56	946 48	-----	109,949 31	30,429 22
Solano	111,903 41	30,472 09	30,306 26	2,030 41	-----	174,712 17	22,635 71
Sonoma	218,675 22	56,971 98	26,183 90	3,866 59	-----	305,697 67	77,519 39
Stanislaus	170.619 45	49,730 56	55.245 06	4,330 53	641 64	280,567 24	82,165 27
Sutter	42,361 75	8,745 59	24,588 33	1,192 20	141 67	77,029 54	22.174 48
Tehama	70,483 00	25,162 78	2,469 30	3,803 77	-----	101,918 85	47,803 95
Trinity	16,330 75	2,416 03	887 32	1,044 83	235 41	20,914 34	6,219 96
Tulare	247,045 56	79,584 90	134,609 28	4,530 56	792 20	466,562 50	149,178 18
Tuolumne	39,239 07	8 535 83	-----	1,048 54	-----	48 823 44	9,198 48
Ventura	111,835 94	26.880 46	72,397 50	3,162 92	31 50	214,3 8 32	41,217 27
Yolo	65,799 49	21,515 11	10,232 82	1,431 28	112 29	99.090 99	56,700 80
Yuba	45.061 80	11,027 78	16,577 40	1,052 35	100 00	73,819 33	15,912 77
Totals	$13,469,080 23	$4,089,053 20	$3,487,293 23	$174,186 39	$39,356 67	$21,258,969 72	$3,767,486 72

TABLE No. 14—Continued.

Statistics of Elementary Schools, Showing Expenditures for All Purposes for School Year Ending June 30, 1918.

Counties	Amount paid for— Teachers (including salary of principal)	Janitors, gardeners, employees	Regular supplies, wood, etc.	Sites, buildings, repairs and furniture	Library books	Apparatus and equipment	Transportation of pupils	Total expenditures	Balance on hand in school funds at close of school year
Alameda	$1,521,736 73	$115,391 78	$262,136 82	$192,486 87	$11,677 03	$2,121 94	$979 53	$2,103,530 70	$98,184 73
Alpine	1,400 00	36 00	216 37	124 43	19 73	----------------	----------------	1,796 53	2,026 78
Amador	44,202 90	3,034 25	5,918 54	8,235 46	836 70	275 50	200 00	62,703 35	14,821 10
Butte	123,736 85	11,480 58	19,435 13	11,190 66	3,623 58	251 57	1,199 95	170,918 32	30,729 07
Calaveras	43 335 50	1,419 29	5,544 26	3,227 59	1,079 12	4,347 98	----------------	58,953 74	15,510 96
Colusa	42.772 71	3,493 50	4,606 32	84.826 80	1 579 21	427 21	490 00	138,195 75	22,486 55
Contra Costa	243.777 86	23,554 81	43,807 09	81,089 71	4,111 35	----------------	----------------	396,340 82	99,400 32
Del Norte	15.903 00	1,083 10	2,437 94	1,783 22	415 22	168 95	----------------	21,791 43	11,000 72
El Dorado	33,093 00	1,029 00	3,550 43	116 60	403 55	291 24	----------------	38,483 82	6,919 56
Fresno	531,990 83	40,873 75	120,076 97	121,297 65	10,413 86	----------------	1,420 00	826,073 06	191,072 14
Glenn	55,062 50	3,652 00	7,308 08	14,044 20	1,071 55	424 29	306 45	81,869 07	30,463 92
Humboldt	172.350 30	17,256 84	17,788 79	13.346 82	4,333 58	1,623 97	10 00	226,710 30	86,475 44
Imperial	145,995 68	14,036 45	19,636 64	48,694 08	2,736 44	1,800 83	2,430 04	235,330 16	40,478 20
Inyo	28,244 34	1,745 25	3,980 70	6,153 56	771 76	1,736 03	----------------	42,631 64	14,057 23
Kern	242.949 64	30,844 14	39,601 62	141,647 69	5,366 44	5,524 09	4,159 02	470,092 64	57,066 69
Kings	96 144 47	9,190 51	10,922 52	27,600 00	2,440 18	----------------	15 00	146,312 65	26,141 98
Lake	26,203 99	901 12	2,774 71	798 16	652 57	----------------	----------------	31,330 55	6,639 23
Lassen	39.593 00	2,453 30	3,606 46	2,737 20	1,281 08	192 27	----------------	49,863 31	22,206 76
Los Angeles	3,419,233 42	499,226 80	840,211 16	683,587 72	32,366 25	8,743 44	6,172 97	5,489,541 76	917,543 64
Madera	65,995 87	5,724 17	9,345 74	8,802 44	2,622 46	----------------	3,607 57	96,098 25	27,064 76
Marin	115,996 24	9,680 74	14,409 81	14,206 35	1,702 28	198 62	666 60	156,860 64	23,538 69
Mariposa	20,154 00	1,144 82	2,018 72	5,198 15	497 01	128 55	----------------	29,141 25	16,232 45
Mendocino	108.182 66	6.550 56	13,142 14	3,946 26	1,396 61	672 06	1,225 00	135,115 29	40,384 74
Merced	103,850 81	11,268 00	15,796 47	97,974 56	2,667 92	235 08	2,520 05	234,312 89	26,756 71
Modoc	39,498 25	3,206 50	5,581 26	13,382 26	686 19	336 14	----------------	62,690 60	10,904 72
Mono	9.580 00	353 50	1,380 16	55 80	273 49	----------------	----------------	11,642 95	6,416 09
Monterey	121,716 01	8,970 50	14,084 72	19,343 83	3,163 06	1,969 61	1,575 50	170,823 23	55,773 06
Napa	61,036 48	5,670 50	20,113 71	6,774 46	1,000 95	500 00	----------------	95,096 10	35,305 89
Nevada	58,349 80	4,488 64	6,272 67	2,654 54	825 09	919 11	----------------	73,509 85	13,645 53
Orange	238.035 00	26,563 75	64,445 59	4,016 38	3,324 36	493 94	1,040 00	337,919 02	40,975 51
Placer	74.233 30	6,399 45	8 391 23	17,782 37	1,370 92	----------------	----------------	108,177 27	23,204 95
Plumas	26.130 50	2,922 54	4,749 98	989 82	1,067 26	199 75	197 90	36,257 75	12,034 33
Riverside	203,078 54	27,368 60	29.289 09	56,211 86	3,495 28	2,130 10	4,206 77	325,780 24	73,277 17
Sacramento	458,855 69	39,480 51	47,329 98	162,979 29	6,610 22	4,907 71	1,068 35	721,231 75	115,783 53

San Benito	36,011 25	2,055 75	6,968 28	2,572 06	2,201 46			49,808 83	11,620 20
San Bernardino	312,192 88	36,051 26	49,822 12	28,036 90	5,579 69	4,464 42	4,985 76	441,123 03	131,310 20
San Diego	416,576 16	57,631 88	41,718 20	48,074 68	6,327 75	1,341 29	1,160 99	572,830 95	149,769 17
San Francisco	1,609,617 90	132,457 16	123,880 00	567,663 16	10,847 00	2,600 00		2,447,065 22	43,266 44
San Joaquin	298,517 12	33,420 50	63,289 61	67,513 81	3,993 17	555 00	120 00	467,409 21	86,155 38
San Luis Obispo	108,648 62	8,430 86	13,054 14	15,992 29	1,421 33	401 24	454 17	148,402 65	20,345 16
San Mateo	163,753 63	16,327 25	32,741 13	115,802 50	2,199 53	712 34	775 00	332,311 28	41,751 37
Santa Barbara	137,755 70	13,413 00	38,620 65	21,663 73	2,402 68	2,795 90	42 50	216,694 16	40,681 93
Santa Clara	369,583 10	24,751 97	46,164 62	45,795 13	4,530 65	1,631 46	456 03	492,912 96	78,085 45
Santa Cruz	122,905 85	14,480 11	16,546 17	4,639 44	2,640 55	485 56	1,000 00	162,607 68	20,168 36
Shasta	82,907 00	5,974 85	12,368 73	5,952 29	1,322 41	438 39		108,963 67	29,524 54
Sierra	14,861 30	867 85	1,898 77	691 79	545 50	72 50		18,937 71	6,608 88
Siskiyou	91,560 86	5,947 31	12,109 75	14,099 46	3,742 56	223 75		127,683 69	26,627 12
Solano	118,729 06	10,578 30	11,377 89	19,037 84	2,183 72	2,114 17		164,020 98	59,533 95
Sonoma	232,155 12	14,711 75	29,911 92	37,462 90	4,307 82	1,679 26		320,228 77	54,752 41
Stanislaus	180,503 72	18,946 73	26,582 21	67,515 53	3,673 84	246 36	5,355 11	302,823 50	76,768 69
Sutter	41,811 47	2,398 22	4,281 40	2,983 76	2,764 68	306 50		54,546 03	22,154 23
Tehama	69,856 00	4,289 39	14,298 98	23,400 14	453 96		615 00	112,913 47	40,897 84
Trinity	17,445 15	618 75	1,443 76	1,481 83	1,003 42	124 00		22,116 91	7,680 04
Tulare	252,763 32	24,289 96	42,271 70	120,186 71	5,307 45	4,998 54	2,914 97	452,732 65	102,154 53
Tuolumne	38,419 54	1,977 50	4,458 71	903 61	189 48	940 69		46,889 53	13,309 26
Ventura	120,550 28	10,029 00	18,395 77	33,696 36	3,766 67	153 00	803 95	187,305 03	42,785 88
Yolo	67,711 90	6,097 25	9,373 78	69,539 92	2,198 80	536 60	154 60	155,612 85	32,746 22
Yuba	47,188 97	1,760 00	12,597 46	6,246 56	1,178 53			68,971 52	8,331 68
Totals	$13,484,445 77	$1,388,001 85	$2,303,997 57	$3,178,259 19	$190,664 90	$67,441 00	$52,328 78	$20,665,139 06	$3,361,552 08

TABLE No. 14—Continued.

Statistics of Elementary Schools, Showing Average Special Tax Rate on Districts for Maintenance, for Buildings; Total Outstanding Bonded Debt by Counties and Average Rate of Interest Paid on Bonds for Years Closing June 30, 1917 and 1918.

Counties	Average tax rate on district for				Total outstanding bonded indebtedness by counties		Average rate of interest paid on bonds	
	Maintenance		Buildings					
	1916-17	1917-18	1916-17	1917-18	1916-17	1917-18	1916-17	1917-18
Alameda	0.17	0.18	0.37	0.06	$1,234,500	$1,778,900	0.046	0.046
Alpine	--------	--------	--------	--------	--------	--------	--------	--------
Amador	.20	.21	--------	.55	--------	--------	--------	--------
Butte	.221	.194	--------	.054	176,020	165,660	.055	--------
Calaveras	--------	--------	--------	.15	--------	--------	--------	--------
Colusa	.15	.215	--------	.293	22,000	102,000	.06	.05
Contra Costa	.17	.18	.16	.16	560,200	556,800	.05	.05
Del Norte	.03	--------	.15	.24	350	--------	--------	--------
El Dorado	--------	--------	.23	--------	35,000	35,000	.05	--------
Fresno	.173	.168	.220	.27	992,186	938,255	.058	.058
Glenn	.12	.144	--------	.35	86,500	107,000	.056	.055
Humboldt	.1371	.405	.718	--------	42,600	37,900	.051	.051
Imperial	.192	.21	.27	.154	426,900	428,700	.06	.06
Inyo	.17	.19	--------	--------	66,250	69,250	.065	.06
Kern	.22	.205	.53	.22	677,350	627,225	.06	.06
Kings	.25	.206	.70	.15	108,990	98,050	.06	.059
Lake	.196	.19	--------	.385	200	100	.075	.07
Lassen	--------	.166	--------	.15	10,583	8,632	.065	.065
Los Angeles	.184	.228	--------	.117	8,764,797	8,358,680	.05	.05
Madera	.128	.325	--------	.36	104.400	93,925	.06	--------
Marin	.19	.20	.055	.08	85,600	106,400	.05	.05
Mariposa	.30	.23	.41	.237	16,100	15,184	.066	.062
Mendocino	.21	.135	.25	.30	16,510	9,390	.06	.057
Merced	.16	.20	--------	--------	188,700	178,925	.055	.06
Modoc	.155	.143	.25	--------	34,880	34,830	.063	.0608
Mono	--------	--------	--------	--------	--------	--------	--------	--------
Monterey	.10	.10	--------	--------	37,100	34,950	.06	.06
Napa	.407	.23	--------	.216	31,400	51,350	.05	.05
Nevada	.10	.10	--------	--------	--------	--------	--------	--------
Orange	.19	.193	.18	.10	614,325	581,000	.05	.05
Placer	.27	.24	.68	--------	96,300	123,400	.06	.05
Plumas	.15	.30	--------	--------	--------	--------	--------	--------
Riverside	.24	.22	.70	.073	435.200	404,640	.057	.058
Sacramento	.1964	.161	.52	.204	861,300	873,800	.052	.052
San Benito	.08	.10	--------	--------	19,600	19,100	.055	.06
San Bernardino	.19	.195	.31	.29	677,100	579,000	.05	.05
San Diego	.25	.258	.31	.14	860,550	836,700	.05	.051
San Francisco	--------	.226	.1020	.074	4,649.000	3,570,440	.0425	.0425
San Joaquin	.177	.191	.18	.15	781,090	766,220	.059	.059
San Luis Obispo	.16	.17	.43	.11	89,550	70.030	.061	.066
San Mateo	.1156	.082	--------	--------	399,100	449,100	.0514	.051
Santa Barbara	.17	.17	.42	.26	118.100	--------	.054	.055
Santa Clara	.192	.217	.225	--------	673,500	638,100	.05	.06
Santa Cruz	.17	.153	--------	--------	100,000	114,600	.053	--------
Shasta	--------	.425	.75	--------	6,150	8,400	.06	.06
Sierra	.25	.05	--------	--------	--------	--------	--------	--------
Siskiyou	.23	.246	--------	.16	33,050	28,150	.06	--------
Solano	.14	.11	.27	.12	92,800	124,500	.054	.05
Sonoma	.19	.169	--------	.30	214,895	198 601	.056	--------
Stanislaus	.212	.214	--------	.118	476,494	488.400	.0525	.0538
Sutter	.125	.1225	.355	--------	38.900	32,350	.06	.06
Tehama	.247	.14	--------	--------	33,500	--------	.055	.06
Trinity	.10	.35	.70	.41	--------	--------	--------	--------
Tulare	.178	.23	.543	.15	662,303	686,884	.058	.06
Tuolumne	.178	.158	--------	.375	41.000	37.350	--------	.055
Ventura	.1534	.16	--------	.08	134,700	139.700	.052	.052
Yolo	.113	.092	--------	--------	137,125	162,125	.05	.053
Yuba	.21	.197	.70	--------	22,200	19,200	.051	.0525
Totals	†0.1805	†0.205	†0.3896	†0.206	$25,986,948	$24,788,796	†0.0556	†0.053

†Average.

TABLE No. 15.

Statistics of Elementary Schools Showing County Tax Rate for Elementary Schools, Average Rate per Pupil Apportioned on Average Daily Attendance in Addition to $550 per Teacher and Average Cost per Pupil, Not Including Cost of Buildings.

Counties	County tax rate for elementary schools		Rate per pupil apportioned on attendance		Average cost per pupil enrolled		Average cost per pupil on attendance
	1916-17	1917-18	1916-17	1917-18	1916-17	1917-18	1917-18
Alameda	0.27	0.27	$17 69	$17 39	$42 36	$43 66	$54 76
Alpine	.10	.20	8 12	41 26	73 22	89 82	94 55
Amador	.43	.43	15 13	13 82	38 85	37 05	40 00
Butte	.38	.39	16 23	17 66	41 43	38 32	50 98
Calaveras	.42	.35	16 92	14 48	37 78	40 03	47 96
Colusa	.20	.22	21 42	24 20	45 07	43 21	50 63
Contra Costa	.31	.31	24 04	23 00	38 45	39 03	45 78
Del Norte	.27	.26	21 87	24 44	45 15	41 27	48 21
El Dorado	.19	.21	5 65	4 00	35 43	36 77	45 29
Fresno	.32	.30	16 13	15 50	35 74	35 09	41 45
Glenn	.21	.23	22 00	22 67	42 22	40 50	48 86
Humboldt	.355	.373	18 83	19 07	36 98	37 46	44 01
Imperial	.28	.28	20 71	18 73	35 60	34 82	48 01
Inyo	.20	.25	16 52	19 19	35 58	36 86	46 64
Kern	.165	.16	17 63	19 23	41 36	40 35	50 69
Kings	.44	.42	20 50	19 50	31 50	31 65	38 93
Lake	.28	.29	7 92	8 93	43 52	31 79	37 38
Lassen	.40	.40	23 15	25 23	40 75	36 30	47 80
Los Angeles	.15	.16	13 90	14 53	52 32	42 24	58 57
Madera	.35	.35	24 63	25 67	52 01	42 98	51 87
Marin	.24	.26	15 97	16 24	39 00	42 23	53 07
Mariposa	.35	.43	16 44	16 70	42 90	42 52	57 00
Mendocino	.32	.32	8 63	8 11	31 38	32 00	39 14
Merced	.25	.245	14 77	15 03	43 24	34 87	40 35
Modoc	.30	.30	19 30	18 90	39 01	43 82	55 53
Mono	.40	.35	47 79	48 36	67 27	72 82	102 54
Monterey	.27	.27	23 78	23 23	36 89	37 55	46 42
Napa	.26	.26	15 61	16 88	43 63	38 75	44 21
Nevada	.50	.50	14 09	15 23	35 43	35 44	41 90
Orange	.25	.23	17 13	17 15	46 18	38 46	47 26
Placer	.40	.38	14 47	15 64	38 04	40 25	48 03
Plumas	.17	.14	19 73	18 62	39 45	36 62	54 59
Riverside	.29	.29	14 63	13 00	49 17	38 72	48 90
Sacramento	.24	.28	17 37	24 60	63 78	48 12	61 96
San Benito	.24	.25	15 20	16 49	41 00	38 00	44 00
San Bernardino	.31	.31	13 05	13 03	41 54	37 81	48 15
San Diego	.22	.22	12 12	12 23	42 86	39 78	51 82
San Francisco	.214	.2301	24 12	26 86	39 58	36 93	50 05
San Joaquin	.20	.20	13 00	13 57	49 90	38 21	47 68
San Luis Obispo	.25	.17	9 73	10 10	38 78	36 12	47 13
San Mateo	.29	.316	20 48	21 53	41 71	39 75	47 05
Santa Barbara	.29	.28	20 13	23 67	38 37	36 75	48 12
Santa Clara	.26	.26	16 37	16 98	35 78	33 40	41 44
Santa Cruz	.385	.395	17 55	18 22	48 14	40 43	52 52
Shasta	.37	.37	15 48	15 77	45 50	35 20	46 56
Sierra	.40	.40	20 77	22 00	18 97	50 50	57 38
Siskiyou	.26	.28	7 65	10 45	32 00	33 29	41 39
Solano	.26	.26	15 65	16 23	38 02	35 50	43 32
Sonoma	.26	.31	9 50	12 00	32 19	33 87	42 08
Stanislaus	.30	.35	13 99	15 60	34 05	32 95	39 07
Sutter	.20	.25	15 32	21 75	40 56	39 66	45 35
Tehama	.35	.40	19 13	29 17	46 68	44 50	53 28
Trinity	.28	.28	12 47	13 80	40 62	41 52	56 70
Tulare	.36	.35	18 20	18 90	42 58	37 87	46 04
Tuolumne	.25	.25	12 49	12 90	32 03	32 16	37 50
Ventura	.23	.233	17 52	18 23	34 91	35 40	46 93
Yolo	.23	.2508	21 75	24 38	40 04	42 95	49 14
Yuba	.30	.30	14 13	14 69	49 58	52 01	58 92
Totals (average)	0.2875	0.295	$16 97	$18 78	$41 48	$39 05	$49 88

TABLE No. 16.

Statistics of Elementary Schools, Showing Valuation of All Property of Such Schools for Year Ending June 30, 1917.

Counties	Sites, buildings, and furniture	Libraries	Apparatus	Total valuation
Alameda	$6,752,246	$56,777	$149,927	$6,958,950
Alpine	3,025	425	250	3,700
Amador	82,795	11,965	6,144	100,904
Butte	451,126	9,995	5,940	467,061
Calaveras	68,485	7,885	3,110	79,480
Colusa	113,675	8,570	3,230	125,475
Contra Costa	848,148	20,526	32,688	901,362
Del Norte	20,250	3,525	1,940	25,715
El Dorado	55,175	7,800	2,845	65,820
Fresno	1,840,811	24,655	16,475	1,881,941
Glenn	181,000	9,945	3,050	193,995
Humboldt	379,200	14,135	7,670	401,005
Imperial	582,605	5,275	5,124	593,004
Inyo	98,925	1,380	930	101,235
Kern	1,140,281	25,386	21,675	1,187,342
Kings	300,100	------------	4,368	304,468
Lake	47,105	4,525	1,416	53,046
Lassen	58,135	5,610	2,200	65,945
Los Angeles	17,544,118	165,930	172,887	17,882,935
Madera	202,000	7,990	3,805	213,795
Marin	334,630	11,345	3,145	349,120
Mariposa	24,295	5,430	2,770	32.495
Mendocino	200,961	27,265	8,726	236,952
Merced	381,560	16,091	6,200	403 851
Modoc	82,425	6,983	2,803	92.211
Mono	8,117	2,836	705	11,658
Monterey	273,432	26,722	13,648	313,802
Napa	199,655	9,935	4,330	213,920
Nevada	158,015	12,369	5,455	175,839
Orange	1,400,950	32.440	22,770	1,456.160
Placer	222,943	11,810	4,215	238,968
Plumas	66,310	3,415	4,240	73,965
Riverside	826.420	15,495	10,725	852,640
Sacramento	1,793,780	18,970	14,050	1,826,800
San Benito	71,625	5,500	2,285	79,410
San Bernardino	1,267,084	31,624	26,302	1,325,010
San Diego	1,794,970	22,984	9,901	1,827,855
San Francisco	10,897,662	39,976	22,000	10 959,638
San Joaquin	1,320,720	29,975	13,810	1,364,505
San Luis Obispo	303,291	18,415	8,419	330,125
San Mateo	634.200	14,800	12,650	661,650
Santa Barbara	456,036	17,171	6,976	480,183
Santa Clara	1,470,360	32,592	15,948	1,518,900
Santa Cruz	454,575	14,581	9,787	478,943
Shasta	218 580	35,495	13,825	267,900
Sierra	33,942	3,270	1,335	38,547
Siskiyou	159,030	15,767	6,968	181,765
Solano	280,500	16,315	5,925	302,740
Sonoma	612,030	32,390	17,635	662,055
Stanislaus	659,247	16,075	8,445	683,767
Sutter	92,125	6,175	3,485	101,785
Tehama	173,820	10,310	5,395	189,525
Trinity	21,050	3,350	1,192	25,592
Tulare	1,066,000	44,750	31,500	1,142,250
Tuolumne	90.125	6,500	4,555	101,180
Ventura	387,860	11,925	5,170	404,955
Yolo	275.311	4,990	3,722	284,023
Yuba	126,330	7,475	3,110	136,915
Totals	$59,609,171	$1,035,810	$789,796	$61,434,777

TABLE No. 16—Continued.

Statistics of Elementary Schools, Showing Valuation of All Property of Such Schools for Year Ending June 30, 1918.

Counties	Sites, buildings, and furniture	Libraries	Apparatus	Total valuation
Alameda	$7,304,282	$55,711	$257,353	$7,617,346
Alpine	3,675	443	250	4,368
Amador	90,950	12,933	14,148	118,031
Butte	431,925	8,850	35,115	475,890
Calaveras	61,885	7,505	9,114	78,504
Colusa	187,155	8,805	8,370	204,330
Contra Costa	898,720	39,131	11,688	949,539
Del Norte	20,000	3,630	2,650	26,280
El Dorado	80,600	6,275	2,570	89,445
Fresno	2,032,677	20,815	45,400	2,098,892
Glenn	185,550	9,480	14,195	209,225
Humboldt	382,010	13,945	8,425	404,380
Imperial	558,025	6,794	57,906	622,725
Inyo	97,615	1,545	8,845	108,005
Kern	1,058,004	24,428	142,105	1,224,537
Kings	297,820	5,000	24,818	327,638
Lake	47,225	5,020	2,477	54,722
Lassen	59,686	4,655	8,084	72,425
Los Angeles	16,675,280	201,486	1,532,273	18,409,039
Madera	204,000	8,015	3,955	215,970
Marin	330,900	12,450	20,200	363,550
Mariposa	38,127	5,880	5,700	49,707
Mendocino	108,065	27,960	13,080	149,105
Merced	355,000	18,340	44,075	417,415
Modoc	88,600	6,615	10,955	106,170
Mono	15,950	3,975	2,255	22,180
Monterey	279,217	25,684	14,855	319,756
Napa	188,105	9,445	7,310	204,860
Nevada	149,235	12,827	6,815	168,877
Orange	1,415,450	33,120	43,000	1,491,570
Placer	222,333	10,500	11,730	244,563
Plumas	64,910	5,885	5,890	76,685
Riverside	724,995	15,185	44,515	784,695
Sacramento	1,589,050	17,470	253,420	1,859,940
San Benito	73,425	5,215	8,275	86,915
San Bernardino	1,200,500	27,260	84,195	1,311,955
San Diego	1,877,638	22,382	38,619	1,938,639
San Francisco	7,011,395	50,745	358,228	7,420,368
San Joaquin	1,298,375	24,045	85,150	1,407,570
San Luis Obispo	290,700	18,870	23,020	332,590
San Mateo	729,800	14,650	33,250	777,700
Santa Barbara	472,593	16,364	6,996	495,953
Santa Clara	1,386,047	34,345	119,547	1,539,939
Santa Cruz	430,475	14,191	31,112	475,778
Shasta	219,880	34,600	15,160	269,640
Sierra	34,027	3,330	1,375	38,732
Siskiyou	157,670	15,710	22,530	195,910
Solano	250,100	14,940	45,755	310,795
Sonoma	620,550	32,785	58,295	711,630
Stanislaus	725,013	17,065	42,198	784,276
Sutter	91,025	6,735	3,800	101,560
Tehama	174,820	10,110	5,445	190,375
Trinity	21,145	3,110	1,930	26,185
Tulare	1,116,100	44,950	41,750	1,202,800
Tuolumne	89,925	6,250	4,605	100,780
Ventura	403,240	9,335	14,225	426,800
Yolo	302,250	6,950	20,545	329,745
Yuba	126,455	7,225	3,140	136,820
Totals	$55,350,169	$1,090,964	$3,742,686	$60,183,819

Section 4.

SECONDARY (HIGH) SCHOOLS.

TABLE NO. 17. Number of Schools by Counties, Number of Teachers Employed, and Kinds of Certificates Held.

TABLE NO. 18. Showing Number of Pupils Enrolled in Regular High Schools, Special Classes, and Junior Colleges, and Total Enrollment in all Grades in the Regular High Schools, Special Day and Evening Classes, Junior Colleges, and Post Graduate High Schools.

TABLE NO. 19. Showing Actual Number of Days Schools Were Open, Average Daily Attendance, and Total Number of Graduates.

TABLE NO. 20. Showing Amount of Money Apportioned to the High Schools by the State, Receipts from all Sources, Expenditures for all Purposes, Valuation of all Property.

TABLE NO. 21. Rate of County Taxes to Produce $60 per Pupil in Average Daily Attendance, Rate of District Taxes for Maintenance and Building, and Average Rate of Interest Paid on Bonds Issued, Average Cost per Pupil Enrolled and in Average Daily Attendance in High Schools.

TABLE NO. 22. Showing Number of Principals and Average Salary, Number of Regular Teachers and Average Salary, and Number of Special Teachers and Average Salary.

TABLE No. 17.

Statistics of Secondary (High) Schools, Showing Number of Schools and Number of Teachers by Sex and by County and Kinds of Certificates Held by Teachers.

Counties	Number of schools		1916-17						
			Number of teachers employed				Total number of teachers	Kinds of certificates held	
			Regular		Special				
	1916-17	1917-18	Men	Women	Men	Women		High	Special
Alameda	15	17	121	173	56	53	403	247	156
Alpine	------	------	------	------	------	------	------	------	------
Amador	3	3	4	6	1	3	14	10	4
Butte	4	4	13	20	5	4	42	34	8
Calaveras	2	2	4	5	------	------	9	8	1
Colusa	5	5	9	16	------	------	25	23	2
Contra Costa	7	7	7	31	6	8	52	38	14
Del Norte	1	1	1	3	1	1	6	4	2
El Dorado	1	1	1	4	1	0	6	5	1
Fresno	14	14	57	62	22	10	151	121	30
Glenn	2	3	5	6	2	1	14	11	3
Humboldt	5	5	11	23	4	3	41	34	7
Imperial	6	6	17	19	10	12	58	36	22
Inyo	4	4	6	6	0	2	14	12	2
Kern	6	5	23	24	9	4	60	47	13
Kings	3	3	8	13	4	3	28	21	7
Lake	3	3	5	6	------	------	11	11	0
Lassen	2	2	4	4	------	------	8	8	0
Los Angeles	50	49	333	603	226	368	1,530	936	594
Madera	3	3	4	8	1	1	14	12	2
Marin	3	3	6	14	8	5	33	20	13
Mariposa	1	1	1	1	------	------	2	2	0
Mendocino	8	8	15	20	3	------	38	31	7
Merced	6	6	12	19	3	6	40	31	9
Modoc	3	3	4	7	1	3	15	11	4
Mono	------	------	------	------	------	------	------	------	------
Monterey	5	5	11	19	5	4	39	30	9
Napa	3	3	7	11	1	6	25	18	7
Nevada	3	3	6	10	1	1	18	16	2
Orange	5	5	40	47	14	17	118	87	31
Placer	3	3	11	15	0	2	28	26	2
Plumas	1	1	1	2	1	0	4	3	1
Riverside	11	11	38	36	16	19	109	74	35
Sacramento	6	6	42	61	------	------	103	77	26
San Benito	1	1	3	4	1	------	8	7	1
San Bernardino	8	8	31	34	26	30	121	68	53
San Diego	11	12	60	71	44	38	213	131	82
San Francisco	8	8	74	75	41	51	241	149	92
San Joaquin	5	5	18	25	10	10	63	43	20
San Luis Obispo	4	4	12	10	1	4	27	22	5
San Mateo	5	5	8	14	5	7	34	19	15
Santa Barbara	5	5	17	18	8	8	51	42	9
Santa Clara	10	10	28	60	18	33	139	87	52
Santa Cruz	3	4	10	18	4	8	40	28	12
Shasta	3	3	7	9	5	1	22	16	6
Sierra	1	1	1	2	------	------	3	3	0
Siskiyou	4	3	11	9	1	2	23	20	3
Solano	6	6	14	24	4	8	50	39	11
Sonoma	7	7	13	36	8	6	63	49	14
Stanislaus	8	8	20	33	6	9	68	53	15
Sutter	1	1	5	3	------	------	8	5	3
Tehama	3	3	9	13	1	------	23	22	1
Trinity	1	1	1	2	1	------	4	3	1
Tulare	9	9	30	41	9	13	93	72	21
Tuolumne	2	2	3	6	3	1	13	10	3
Ventura	5	5	11	20	9	6	46	31	15
Yolo	3	3	5	15	3	4	27	21	6
Yuba	2	2	6	5	2	3	16	11	5
Totals	309	311	1,224	1,841	611	778	4,454	2,995	1,459

TABLE No. 17—Continued.

Statistics of Secondary (High) Schools Showing Number of Teachers by Sex and by County, and Kinds of Certificates Held for Year Ending June 30, 1918.

Counties	Number of teachers employed in— High school, Regular, Men	High school, Regular, Women	High school, Special, Men	High school, Special, Women	Junior college, Regular, Men	Junior college, Regular, Women	Grand total	Teachers' certificates, Full high school	Teachers' certificates, Special
Alameda	115	204	109	116			544	317	227
Alpine									
Amador	4	9	1	2			16	13	3
Butte	13	21	4	4			42	39	3
Calaveras	4	5					9	9	
Colusa	9	16					25	21	4
Contra Costa	8	37	6	9			60	45	15
Del Norte	1	4	1				6	5	1
El Dorado	2	3	1	1			7	5	2
Fresno	59	70	24	17			170	131	39
Glenn	4	10	3	1			18	14	4
Humboldt	7	31	7	5	1		51	39	12
Imperial	19	28	9	18			74	47	27
Inyo	5	8		2			15	13	2
Kern	27	33	4	1			65	50	15
Kings	8	12	5	3			28	20	8
Lake	5	8					13	12	1
Lassen	4	4					8	8	
Los Angeles	310	621	229	397	1	3	1,561	935	626
Madera	6	9	2	4			21	16	5
Marin	7	17	8	6			38	24	14
Mariposa	1	2					3	3	
Mendocino	11	23	5	3			42	34	8
Merced	11	20	3	5			39	32	7
Modoc	3	9	1	2			15	12	3
Mono									
Monterey	11	19	5	6			41	30	11
Napa	8	11	1	6			26	19	7
Nevada	6	10	1	1			18	16	2
Orange	34	52	19	23			128	86	42
Placer	10	12	3	6			31	22	9
Plumas	2	1	1				4	3	1
Riverside	39	44	16	18			117	83	34
Sacramento	27	46	19	17			109	73	36
San Benito	4	4	1	1			10	8	2
San Bernardino	45	59	14	17			135	94	41
San Diego	53	73	39	39			204	126	78
San Francisco	64	76	46	62			248	159	89
San Joaquin	17	30	17	12			76	47	29
San Luis Obispo	13	15	1	5			34	28	6
San Mateo	6	14	5	8			33	20	13
Santa Barbara	18	24	9	4			55	40	15
Santa Clara	26	65	23	28			142	90	52
Santa Cruz	13	19	5	6			43	32	11
Shasta	7	13	5				25	20	5
Sierra	1	3					4	4	
Siskiyou	13	8		6			27	21	6
Solano	13	26	2	8			49	39	10
Sonoma	15	43	6	3			67	58	9
Stanislaus	19	46	5	8			78	63	15
Sutter	3	2	1	2			8	5	3
Tehama	7	11	3	3		2	26	20	6
Trinity	1	3					4	4	
Tulare	27	45	9	12			93	77	16
Tuolumne	2	10	1	2			15	12	3
Ventura	15	19	4	10			48	34	14
Yolo	6	15	4	2			27	21	6
Yuba	5	6	2	3			16	11	5
Totals	1,173	2,028	689	914	2	5	4,811	3,209	1,602

TABLE No. 18.

Statistics of Secondary (High) Schools, Showing Enrollment of Pupils in Regular and Post Graduate High Schools for Year Closing June 30, 1917, Also Number of Graduates.

Counties	Regular high, 1916-17		Post-graduate high, 1916-17		Number of graduates from regular high schools, 1916-17		
	Total boys	Total girls	Total boys	Total girls	Boys	Girls	Total
Alameda	6,415	7,181	--------	--------	385	537	922
Alpine	--------	--------	--------	--------	--------	--------	--------
Amador	113	131	--------	--------	12	25	37
Butte	378	510	--------	--------	42	88	130
Calaveras	60	82	--------	--------	6	10	16
Colusa	105	122	--------	--------	12	22	34
Contra Costa	384	521	--------	--------	50	92	142
Del Norte	26	44	--------	--------	2	7	9
El Dorado	39	80	--------	--------	8	13	21
Fresno	1,479	1,565	43	36	171	199	370
Glenn	123	152	--------	--------	16	18	34
Humboldt	606	773	--------	4	40	88	128
Imperial	652	732	--------	--------	42	63	105
Inyo	87	107	1	1	6	15	21
Kern	404	446	11	11	40	59	99
Kings	196	294	--------	--------	17	43	60
Lake	94	84	--------	--------	15	13	28
Lassen	47	67	--------	--------	1	6	7
Los Angeles	19,316	21,928	376	466	1,176	1,629	2,805
Madera	83	119	--------	--------	5	14	19
Marin	249	295	--------	5	33	47	80
Mariposa	11	13	--------	--------	1	--------	1
Mendocino	286	369	--------	--------	41	72	113
Merced	195	241	--------	--------	14	45	59
Modoc	81	99	--------	2	9	14	23
Mono	--------	--------	--------	--------	--------	--------	--------
Monterey	262	330	--------	--------	23	41	64
Napa	193	263	--------	--------	24	43	67
Nevada	167	218	--------	--------	25	44	69
Orange	894	1,138	56	96	106	185	291
Placer	167	208	7	7	20	31	51
Plumas	13	30	--------	--------	--------	--------	--------
Riverside	705	789	50	64	91	132	223
Sacramento	1,547	2,199	9	36	--------	--------	--------
San Benito	64	127	--------	--------	8	23	31
San Bernardino	952	1,189	22	43	141	182	323
San Diego	2,759	3,655	73	94	117	181	298
San Francisco	5,582	4,645	--------	--------	381	395	776
San Joaquin	909	1,157	--------	--------	62	87	149
San Luis Obispo	163	226	5	5	21	34	55
San Mateo	364	379	--------	--------	29	41	70
Santa Barbara	359	477	26	47	55	63	118
Santa Clara	2,193	2,226	--------	--------	160	226	386
Santa Cruz	319	456	--------	--------	46	72	118
Shasta	157	213	--------	--------	16	26	42
Sierra	10	11	--------	--------	2	1	3
Siskiyou	155	176	5	13	15	19	34
Solano	277	431	--------	--------	32	61	93
Sonoma	593	763	--------	--------	85	120	205
Stanislaus	503	708	--------	--------	81	100	181
Sutter	62	47	--------	--------	9	7	16
Tehama	184	267	--------	--------	23	32	55
Trinity	21	27	--------	--------	2	7	9
Tulare	775	932	--------	--------	112	174	286
Tuolumne	87	135	--------	--------	9	23	32
Ventura	311	393	--------	--------	45	47	92
Yolo	191	239	--------	--------	19	50	69
Yuba	135	173	--------	--------	14	27	41
Totals	52,502	60,182	684	930	3,917	5,593	9,510

TABLE No. 18—Continued.

Statistics of Secondary (High) Schools, Showing Enrollment in Regular High, Special Day and Evening Classes of Day High Schools, Junior Colleges and Post Graduate High Schools for Year Ending June 30, 1918.

Counties	Regular four year high, 1917-18		Special day and evening classes of day high school,		Junior colleges, 1917-18		Total enrollment in all high schools, 1917-18		Total, 1917-18	Total enrollment in post-graduate high schools, 1917-18	
	Total boys	Total girls	Total boys	Total girls	Total boys	Total girls	Boys	Girls		Boys	Girls
Alameda	8,422	11,829	301	1,458	------	------	8,725	13,287	22,012	------	------
Alpine	------	------	------	------	------	------	------	------	------	------	------
Amador	124	124	1	2	------	------	125	126	251	------	------
Butte	374	565	------	------	------	------	374	565	939	------	------
Calaveras	51	67	------	------	------	------	51	67	118	------	------
Colusa	84	120	------	------	------	------	84	120	204	------	------
Contra Costa	351	584	------	------	------	------	351	584	935	------	------
Del Norte	22	41	------	------	------	------	22	41	63	------	------
El Dorado	50	80	------	------	------	------	50	80	130	------	------
Fresno	1,348	1,697	------	------	34	54	1,382	1,751	3,133	------	------
Glenn	126	202	------	------	------	------	126	202	328	------	------
Humboldt	418	698	88	66	10	8	516	772	1,288	------	------
Imperial	579	796	------	------	------	------	579	796	1,375	------	------
Inyo	83	106	------	3	------	------	83	109	192	------	------
Kern	480	620	84	171	6	14	570	805	1,375	------	------
Kings	169	275	66	102	------	------	235	377	612	------	------
Lake	83	96	------	------	------	------	83	96	179	------	------
Lassen	63	77	------	------	------	------	63	77	140	------	------
Los Angeles	16,976	21,274	520	937	266	525	17,762	22,736	40,498	21	60
Madera	95	142	------	------	------	------	95	142	237	------	------
Marin	232	321	62	37	------	------	294	358	652	------	------
Mariposa	8	17	------	------	------	------	8	17	25	------	------
Mendocino	261	381	38	24	------	------	299	405	704	------	------
Merced	216	253	------	------	------	------	216	253	469	------	------
Modoc	86	106	------	------	------	------	86	106	192	------	------
Mono	------	------	------	------	------	------	------	------	------	------	------
Monterey	281	351	7	15	------	------	288	366	654	------	------
Napa	183	266	------	------	------	------	183	266	449	------	------
Nevada	163	229	------	------	------	------	163	229	392	------	------
Orange	902	1,180	45	96	46	85	993	1,361	2,354	------	------
Placer	229	218	26	------	3	2	258	220	478	------	------
Plumas	17	32	------	------	------	------	17	32	49	------	------
Riverside	662	813	194	406	42	95	898	1,314	2,212	6	16
Sacramento	1,489	2,045	36	1,044	9	59	1,534	3,148	4,682	------	------
San Benito	60	112	------	------	------	------	60	112	172	1	3
San Bernardino	966	1,288	567	640	31	65	1,564	1,993	3,557	------	------
San Diego	1,093	1,348	1,824	2,397	26	55	2,943	3,800	6,743	8	31
San Francisco	4,854	4,400	------	------	------	------	4,854	4,400	9,254	------	------
San Joaquin	1,625	1,848	22	21	------	------	1,647	1,869	3,516	------	------
San Luis Obispo	161	256	106	193	4	5	271	454	725	------	------
San Mateo	396	544	------	------	------	------	396	544	940	------	------
Santa Barbara	367	460	32	------	30	44	429	504	933	------	------
Santa Clara	1,697	2,588	12	203	------	------	1,709	2,791	4,500	------	------
Santa Cruz	426	500	------	------	------	------	426	500	926	------	------
Shasta	125	218	32	58	------	------	157	276	433	------	------
Sierra	15	17	------	------	------	------	15	17	32	------	------
Siskiyou	127	184	27	36	------	------	154	220	374	------	------
Solano	267	467	------	------	------	------	267	467	734	------	------
Sonoma	488	675	54	47	------	------	542	722	1,264	------	------
Stanislaus	473	763	------	------	4	14	477	777	1,254	------	3
Sutter	61	58	------	------	------	------	61	58	119	------	------
Tehama	178	306	------	------	7	18	185	324	509	------	------
Trinity	20	18	------	------	------	------	20	18	38	------	------
Tulare	727	981	43	66	------	------	770	1,047	1,817	------	------
Tuolumne	78	134	------	------	------	------	78	134	212	------	7
Ventura	281	403	------	------	------	------	281	403	684	------	------
Yolo	181	249	4	------	------	------	185	249	434	------	------
Yuba	103	165	------	------	------	------	103	165	268	------	------
Totals	49,396	63,587	4,191	8,022	518	1,043	54,107	72,652	126,759	36	120

TABLE No. 18—Continued.

Statistics of Secondary (High) Schools, Showing Enrollment of Students by Grades and by Sex for the State, in Regular High Schools, Special Day and Evening Classes, and Junior College, and Grand Total in Such Schools.

Enrolled in regular high schools	1916-17	1917-18
First year—		
Boys	29,409	26,444
Girls	32,599	31,800
Second year—		
Boys	10,704	10,143
Girls	11,589	14,440
Third year—		
Boys	6,365	6,889
Girls	8,104	9,404
Fourth year—		
Boys	6,024	5,320
Girls	7,890	7,943
Totals—		
Boys	52,502	49,396
Girls	60,182	63,587
Grand totals	112,684	112,983
Enrolled in Special Day and Evening Classes.		
First year—		
Boys	------------	3,948
Girls	------------	7,545
Second year—		
Boys	------------	152
Girls	------------	150
Third year—		
Boys	------------	57
Girls	------------	67
Fourth year—		
Boys	------------	34
Girls	------------	260
Totals—		
Boys	------------	4,191
Girls	------------	8,022
Grand total	------------	12,213
Enrolled in Junior College.		
First year—		
Boys	------------	451
Girls	------------	871
Second year—		
Boys	------------	67
Girls	------------	172
Totals—		
Boys	------------	518
Girls	------------	1,043
Grand total	------------	1,561

Total Enrollment in All Regular High Schools, Including Special Day and Evening Classes of Day High Schools and Junior Colleges, by Years.

	1916-17	1917-18
First year—		
Boys	29,409	30,845
Girls	32,599	40,216
Second year—		
Boys	10,704	10,962
Girls	11,589	14,762
Third year—		
Boys	6,365	6,946
Girls	8,104	9,471
Fourth year—		
Boys	6 024	5,354
Girls	7,890	8,203
Totals—		
Total boys	52,502	54,107
Total girls	60,182	72,652
Grand totals	112,684	126,759

Enrollment in Postgraduate High Schools.

	1916-17	1917-18
First year—		
Boys	577	32
Girls	791	108
Second year—		
Boys	107	4
Girls	139	12
Totals—		
Total boys	784	36
Total girls	930	120
Grand totals	1,614	156

NOTE.—The law providing for special day and evening classes of day high schools and junior colleges went into effect in August, 1917. The law providing for post graduate high schools has been in effect for several years, but under a recent opinion of the Attorney General these schools do not participate in either state or county aid. Most of the pupils in these schools were enrolled in junior colleges for 1917–18.

TABLE No. 19.

Statistics of Secondary (High) Schools, Showing Average Number of Days Schools Were Actually Open, Average Daily Attendance, and Number of Graduates for 1916-17 and 1917-18.

Counties	Average number days schools were open by counties		Average daily attendance in—				Total number graduates, 1917-18		
			Regular high		Post-graduate high				
	1916-17	1917-18	1916-17	1917-18	1916-17	1917-18	Boys	Girls	Total
Alameda	189	187	6,749	7,544	--------	--------	401	562	963
Alpine	--------	--------	--------	--------	--------	--------	--------	--------	--------
Amador	189	188	192	192	--------	--------	9	13	22
Butte	179	177	705	714	--------	--------	52	103	155
Calaveras	182	183	126	97	--------	--------	9	13	22
Colusa	180	177	189	168	--------	--------	12	24	36
Contra Costa	190	188	765	782	--------	--------	49	82	131
Del Norte	196	188	60	57	--------	--------	3	10	13
El Dorado	191	180	108	107	--------	--------	10	22	32
Fresno	173	171	2,318	2,560	55	--------	136	213	349
Glenn	187	177	223	249	--------	--------	--------	--------	--------
Humboldt	171	188	753	782	2	--------	42	81	123
Imperial	170	170	690	678	--------	--------	47	66	113
Inyo	179	178	158	162	2	--------	12	16	28
Kern	171	168	733	871	15	--------	81	76	157
Kings	170	167	404	367	--------	--------	19	25	44
Lake	170	170	155	153	--------	--------	14	12	26
Lassen	171	170	107	110	--------	--------	5	7	12
Los Angeles	182	180	18,776	19,002	376	31	1,116	1,756	2,872
Madera	180	173	174	205	--------	--------	7	18	25
Marin	189	188	465	463	--------	--------	24	44	68
Mariposa	186	174	21	20	--------	--------	1	6	7
Mendocino	186	184	552	549	--------	1	32	63	95
Merced	185	176	377	398	--------	--------	42	31	73
Modoc	189	184	139	155	2	--------	12	23	35
Mono	--------	--------	--------	--------	--------	--------	--------	--------	--------
Monterey	188	184	489	513	--------	--------	41	53	94
Napa	188	185	373	354	--------	--------	22	34	56
Nevada	187	183	347	344	--------	--------	22	44	63
Orange	178	174	1,750	1,854	116	--------	85	177	262
Placer	188	181	334	356	11	--------	27	43	70
Plumas	189	186	32	34	--------	--------	1	4	5
Riverside	169	168	1,264	1,324	64	18	82	117	199
Sacramento	185	178	1,626	1,583	20	--------	78	155	233
San Benito	187	185	172	148	--------	3	7	27	34
San Bernardino	171	169	1,807	1,990	44	--------	119	197	316
San Diego	180	171	2,417	2,553	92	25	122	188	310
San Francisco	193	194	5,074	4,999	--------	--------	358	367	725
San Joaquin	179	167	1,123	1,309	--------	--------	59	114	173
San Luis Obispo	179	180	352	366	8	--------	27	39	66
San Mateo	185	180	478	518	--------	--------	34	39	73
Santa Barbara	189	185	682	638	41	--------	54	83	137
Santa Clara	188	177	2,325	2,242	--------	--------	159	201	360
Santa Cruz	190	190	653	674	--------	--------	44	83	127
Shasta	174	169	274	274	--------	--------	18	35	53
Sierra	194	174	16	27	--------	--------	--------	2	2
Siskiyou	181	163	267	237	11	--------	18	24	42
Solano	181	180	565	541	--------	--------	32	67	99
Sonoma	187	184	1,111	1,066	--------	--------	64	126	190
Stanislaus	189	178	992	1,030	--------	3	40	120	160
Sutter	187	181	101	102	--------	--------	9	9	18
Tehama	173	172	376	384	--------	--------	22	51	73
Trinity	189	192	41	30	--------	--------	1	3	4
Tulare	169	170	1,445	1,392	--------	--------	98	154	252
Tuolumne	180	171	194	190	--------	6	14	19	33
Ventura	189	190	605	560	--------	--------	41	56	97
Yolo	182	184	369	364	--------	--------	30	47	77
Yuba	179	172	272	248	--------	--------	13	28	41
Totals	†189	†178	62,865	64,671	859	87	3,876	5,972	9,848

†Average.

TABLE No. 20.

Statistics of Secondary (High) Schools, Showing Amounts of State High School Money Apportioned, by County, to the Several High Schools of Each County for Year Closing June 30, 1917.

	Apportionment, Sept. 13, 1916	Apportionment, Feb. 14, 1917	Apportionment, Sept. 1, 1917	Apportionment, Feb. 20, 1918	Total apportionment	
					1916-17	1917-18
Alameda	$42,588 54	$30,015 63	$48,819 10	$33,927 70	$72,604 17	$82,746 80
Alpine	--------	--------	--------	--------	--------	--------
Amador	2,860 63	2,016 17	2,932 80	2,038 56	4,876 83	4,971 36
Butte	6,414 10	4,520 57	6,559 50	4,558 98	10 934 67	11,118 48
Calaveras	1,914 92	1,349 62	1,943 40	1,350 84	3.264 54	3,294 24
Colusa	4,341 94	3,060 17	4,315 70	2,999 90	7,402 11	7,315 60
Contra Costa	8,272 70	5,830 51	8,713 50	6,056 34	14,103 21	14,769 84
Del Norte	934 02	658 29	954 00	663 12	1,592 31	1,617 12
El Dorado	1,144 98	806 97	1,237 20	859 92	1,951 95	2,097 12
Fresno	19,871 60	14,005 24	22,365 30	15,544 38	33,876 84	37,909 68
Glenn	2,219 64	1,564 38	2,326 90	1,617 34	3,784 02	3,944 24
Humboldt	6,250 02	4,404 93	7,442 70	5,172 90	10,654 95	12,615 60
Imperial	7,250 78	5,110 27	7,671 00	5,331 72	12,361 05	13,002 72
Inyo	2,137 60	1,506 56	3,332 20	2,316 28	3,644 16	5,648 48
Kern	6,551 16	4,617 18	8,072 20	5,610 52	11,168 34	13,682 72
Kings	3,768 96	2,656 32	4,030 20	2,801 16	6,425 28	6,831 36
Lake	2,008 68	1,415 70	2,714 50	1,886 86	3,424 38	4,601 36
Lassen	963 32	678 94	1,778 20	1,236 04	1,642 26	3,014 24
Los Angeles	134,582 44	94,851 38	140,778 40	97,837 60	229,433 82	238,616 00
Madera	2,020 40	1,423 96	2,826 60	1,964 76	3,444 36	4,791 36
Marin	4,284 64	3,019 76	4,543 50	3,157 86	7,304 40	7,701 36
Mariposa	723 06	509 61	723 90	503 22	1,232 67	1,227 12
Mendocino	6,977 64	4,917 78	8,056 80	5,600 16	11,895 42	13,656 96
Merced	5,926 42	4,176 89	5,977 70	4,155 02	10,103 31	10,132 72
Modoc	2,643 84	1,863 36	2,649 60	1,841 76	4,507 20	4,491 36
Mono	--------	--------	--------	--------	--------	--------
Monterey	5,683 88	4,005 94	5,885 10	4,090 50	9,689 82	9,975 60
Napa	4,015 08	2,829 78	4.012 50	2,788 86	6,844 86	6,801 36
Nevada	3,739 63	2,635 67	3,847 30	2,674 03	6,375 33	6,521 36
Orange	12,926 84	9,110 62	13,325 00	9,260 60	22,037 46	22,585 60
Placer	3,733 80	2,631 54	3,770 60	2,620 76	6,365 34	6.391 36
Plumas	793 38	559 17	777 00	540 12	1,352 55	1,317 12
Riverside	14,112 52	9,946 34	14,057 60	9,770 72	24,058 86	23,828 32
Sacramento	11,772 42	8.297 01	13,099 00	9,103 72	20,069 43	22,202 72
San Benito	1,525 88	1,075 42	1,614 80	1,122 32	2,601 30	2,737 12
San Bernardino	14,908 50	10,507 29	15,461 30	10,745 63	25,415 79	26.206 93
San Diego	19,460 42	13,715 41	20,860 30	14,498 02	33,175 83	35,358 32
San Francisco	31,263 76	22,034 12	34,736 60	24,140 36	53,297 88	58,876 96
San Joaquin	7,820 50	5,511 77	9,578 50	6,657 10	13,332 27	16,235 60
San Luis Obispo	3,552 14	2,503 51	4,476 80	3,111 68	6,055 65	7,588 48
San Mateo	5,390 88	3,799 44	5,820 20	4,045 40	9,190 32	9,865 60
Santa Barbara	7,031 68	4,955 84	7,023 80	4,881 80	11.987 52	11,905 60
Santa Clara	20,128 46	14,186 23	19,717 50	13,703 70	34,314 69	33,421 20
Santa Cruz	5.655 88	3,986 18	5,652 70	3,928 66	9,642 06	9.581 36
Shasta	3,405 64	2,400 26	3,440 20	2,391 16	5,805 90	5,831 36
Sierra	711 34	501 35	706 20	490 92	1,212 69	1,197 12
Siskiyou	3,036 46	2.140 07	3,975 30	2,763 18	5,176 53	6.738 48
Solano	6 969 50	4,912 03	6,933 50	4,819 22	11,881 53	11,752 72
Sonoma	9,477 58	6,679 67	10,743 10	7,466 74	16,157 25	18,209 84
Stanislaus	9,845 46	6,938 97	10,652 80	7,404 16	16,784 43	18,056 96
Sutter	1,180 14	831 75	1,195 90	831 22	2.011 89	2,027 12
Tehama	3,145 52	2.216 92	4,018 40	2,792 96	5,362 44	6.811 36
Trinity	793 38	559 17	841 90	585 22	1,352 55	1,427 12
Tulare	13,187 94	9.294 69	13,488 90	9,375 18	22,482 63	22,861 08
Tuolumne	2,231 36	1,572 64	2,344 60	1,629 64	3,804 00	3,974 24
Ventura	6,592 18	4,646 09	6,569 50	4,566 10	11,238 27	11,135 60
Yolo	3,950 62	2,784 35	4,106 90	2,854 46	6,734 97	6.961 36
Yuba	3,147 80	2,218 54	2.804 80	1,949 44	5,366 34	4,754 24
Totals	$517,842 16	$364,967 97	$556,303 50	$386,636 58	$882,810 13	$942,940 08

Rate of Apportionment for Each Year.

September 13, 1916	per school, $600.00;	per pupil on attendance, $5.86
February 14, 1917	per school, 422.88;	per pupil on attendance, 4.13
Total per year	per school, $1,022.88;	per pupil on attendance, $9.99
September 1, 1917	per school, $600.00;	per pupil on attendance, $5.90
February, 1918	per school, 417.12;	per pupil on attendance, 4.10
Total for year	per school, $1,017.12;	per pupil on attendance, $10.00

NOTE.—One-third of state money is apportioned on school basis; two-thirds on attendance basis.

TABLE No. 20—Continued.

Statistics of Secondary (High) Schools, Showing Receipts from All Sources for High School Purposes, by Counties, for Year Closing June 30, 1917.

Counties	Balance on hand, 1916-17	State apportionment, 1916-17	County apportionment, 1916-17	City or district taxes (maintenance), 1916-17	City or district taxes for buildings, 1916-17	Sale of bonds for buildings, 1916-17	Miscellaneous sources, 1916-17	Total receipts for 1916-17
Alameda	$38,142 47	$72,604 17	$407,303 94	$319,334 05			$4,559 59	$841,944 22
Alpine								
Amador	7,437 27	4,876 83	12,265 41	13,766 50	$2,009 40			40,355 41
Butte	22,132 11	10,934 67	47,793 70	20,722 60		$82,864 00	3,502 86	187,949 94
Calaveras	8,498 42	3,264 54	9,148 51	1,979 63	2,696 04			25,587 14
Colusa	15,902 76	7,402 11	13,745 10	22,969 08			93 06	60,112 11
Contra Costa	47,485 63	14,103 21	48,224 68	81,772 49		15,761 13	376 41	207,723 55
Del Norte	6,807 92	1,592 31	9,253 41				223 85	17,877 49
El Dorado	5,890 86	1,951 95	12,515 88				57 56	20,416 25
Fresno	155,589 67	33,876 84	126,788 92	145,018 58		25,069 03	13,574 70	499,917 74
Glenn	12,380 68	3,784 02	11,192 51	18,099 78				45,456 99
Humboldt	32,240 50	10,654 95	39,420 00	30,032 03			8,045 64	120,393 12
Imperial	133,327 34	12,361 05	41,329 40	67,282 42			1,557 57	255,857 78
Inyo	254 23	3,644 16	11,709 08	12,275 81			2,128 29	30,011 57
Kern	132,899 87	11,168 34	37,436 60	111,772 10	30 14		10,820 20	304,127 25
Kings	14,694 31	6,425 28	20,512 85	38,531 51			1,042 37	81,206 32
Lake	32,079 43	3,424 38	10,715 78	3,969 63			28 00	50,217 22
Lassen	5,013 99	1,642 26	5,286 00	6,969 11				18,911 36
Los Angeles	1,641,753 71	229,512 81	1,101,722 53	1,796,367 63			338,014 18	5,107,370 86
Madera	4,558 18	3,444 36	9,400 00	17,498 27		55,358 00		90,258 81
Marin	9,629 88	7,304 40	24,193 10	25,076 85				66,204 23
Mariposa	2,560 01	1,232 67	3,130 71			12,801 00		19,724 39
Mendocino	38,416 13	11,895 42	29,778 00	24,323 64			1,216 85	105,630 04
Merced	25,317 04	10,103 31	22,692 96	43,395 94		160,536 00	115 45	262,160 70
Modoc	2,698 32	4,507 20	9,623 22	11,567 98			382 64	28,689 36
Mono								
Monterey	11,661 05	9,689 82	28,816 00	40,869 81			1,044 48	92,081 16
Napa	15,106 25	6,844 86	42,085 42				332 19	64,368 72
Nevada	3,573 77	6,375 33	19,962 00	3,129 67	2,122 64		332 61	35,496 02
Orange	22,938 41	22,037 46	112,416 16	140,926 99	9,760 36			308,079 38
Placer	25,075 00	6,365 34	22,103 60	30,054 39			368 36	83,966 69
Plumas	3,862 60	1,352 55	9,097 71				2 50	14,315 36
Riverside	77,132 41	24,058 86	90,311 26	94,019 40	8,475 00	43,125 00	2,290 04	339,411 97
Sacramento	11,161 41	20,069 43	90,126 92	101,152 18			3,208 17	225,718 11

San Benito	2,601 05	2,601 30	13;686 97					18,889 32
San Bernardino	122,296 75	25,415 79	110,674 99	158,144 28			2,778 20	419,310 01
San Diego	52,466 97	33,175 83	122,005 68	202,271 22			2,124 09	412,043 79
San Francisco	26,684 75	53,297 88	417,869 85					497,852 48
San Joaquin	9,314 84	13,332 27	56,243 75	65,459 21		93,209 00	1,318 59	238,877 66
San Luis Obispo	9,045 00	6,055 65	21,324 09	23,159 61		17,731 00	416 87	77,732 22
San Mateo	33,910 22	9,190 32	24,078 76	46,061 86		70,676 00	1,052 03	184,969 19
Santa Barbara	26,545 71	11,987 52	43,627 17	52,247 91			5,607 72	140,016 03
Santa Clara	80,832 02	34,314 69	145,969 88	87,743 50		212,267 00	1,225 33	562.352 42
Santa Cruz	6,286 55	9,642 06	37,400 00	29,420 40		105,496 65	3,246 39	191,492 05
Shasta	15,451 41	5,805 90	48,927 68				427 28	70,612 27
Sierra	543 05	1,212 69		3,741 00				5,496 74
Siskiyou	9,715 95	5,176 53	36,257 60		36,653 64		112 86	87,916 58
Solano	21,852 06	11,881 53	36,376 77	54,703 75			596 05	125,410 16
Sonoma	42,948 61	16,157 25	60,611 10	53,440 32			1,468 78	174,626 06
Stanislaus	65,381 35	16,784 43	52,076 00	60,385 86		216,130 00	3,785 20	414,542 84
Sutter	4,820 31	2,011 89	7,886 74	7,156 27				21,875 21
Tehama	97,767 87	5,362 44	18,494 17	20,600 81			2,112 81	144,338 10
Trinity	2,285 39	1,352 55	4,788 08				22 12	8,448 14
Tulare	51,108 48	22,482 63	89,808 00	76,433 69		24,689 33	295 30	264,817 43
Tuolumne	7,126 90	4,749 69	23,143 12					35,019 71
Ventura	31,336 24	11,238 27	37,029 25	54,817 93			3,584 76	138,006 45
Yolo	29,182 48	6,734 97	22,260 05	15,087 80			174 11	73,439 41
Yuba	3,922 88	5,366 34	8,294 18	9,792 88			4,620 00	31,996 28
Totals	$3,319,558 47	$884,171 87	$3,918,598 68	$4,243,546 37	$61,747 22	$1,135,713 14	$428,286 06	$13,991,621 81

TABLE No. 20—Continued.

Statistics of Secondary (High) Schools, Showing Receipts from All Sources for Year Ending June 30, 1918.

Counties	Balance at beginning of year	State apportionment	County apportionment	District taxes for maintenance	District taxes for buildings	Sale of bonds	Miscellaneous sources	Total receipts
Alameda	$83,540 17	$82,746 80	$399,542 43	$388,609 00			$2,185 56	$956,623 96
Alpine								
Amador	4,077 83	4,971 36	12,142 82	9,446 90	$13,576 34	$1,921 56	7 35	46,144 16
Butte	110,604 03	11,118 48	40,503 04	17,169 71	10,000 00		449 20	189,844 46
Calaveras	7,731 87	3,294 24	8,963 54	1,442 12				21,431 77
Colusa	13,949 88	7,315 60	13,032 54	26,862 72				61,160 74
Contra Costa	43,506 60	14,769 84	53,764 08	97,529 51			1,131 72	210,701 75
Del Norte	7,114 13	1,617 12	8,696 40				177 13	17,604 78
El Dorado	2,513 10	2,097 12	11,192 92				707 29	16,510 43
Fresno	78,005 14	37,909 68	131,710 03	193,965 96		101,513 88	16,642 67	559,747 36
Glenn	11,222 65	3,944 24	12,955 78	26,625 76		20,000 00		74,748 43
Humboldt	20,747 44	12,615 60	49,663 20	45,263 66	4,636 13	60,105 00	2,118 69	195,149 72
Imperial	24,559 70	13,002 72	43,160 50	91,663 87			1,230 05	173,616 84
Inyo	7,064 53	5,648 48	7,692 28	13,512 65			1,428 08	35,346 02
Kern	53,276 49	13,682 72	44,346 50	193,321 42	55 09	45,795 00	1,640 27	352,117 49
Kings	21,750 76	6,831 36	25,012 32	32,957 37			600 00	87,151 81
Lake	14,937 54	4,601 36	10,579 30	8,673 12				38,791 32
Lassen	5,168 79	3,014 24	6,454 00	5,477 13			80 40	20,194 56
Los Angeles	647,922 77	238,616 00	1,109,531 36	2,121,052 27			319,072 42	4,436,194 82
Madera	42,211 80	4,791 36	10,428 00	29,700 60	12,313 60			99,445 36
Marin	5,013 53	7,701 36	28,427 11	28,613 94	6,667 38		101 26	76,524 58
Mariposa	11,315 08	1,227 12	2,151 75				408 00	15,101 95
Mendocino	29,964 05	13,656 96	33,056 00	33,224 88	22 24		15,365 46	125,289 59
Merced	166,960 76	10,132 72	29,426 52	40,554 78		25,127 66	995 49	273,197 93
Modoc	4,262 25	4,491 36	9,514 81	11,645 31		15,152 00	33 07	45,098 80
Mono								
Monterey	12,426 25	9,975 60	29,450 00	46,605 99			1,158 69	99,616 53
Napa	21,634 98	6,801 36	46,568 39				203 95	75,208 68
Nevada	7,417 19	6,521 36	20,325 55	3,218 33	367 29		8,879 28	46,729 00
Orange	22,087 77	22,585 60	122,759 47	158,472 67			2,583 35	328,488 86
Placer	17,941 92	6,391 36	24,132 18	35,187 60			64 06	83,717 12
Plumas	7,184 46	1,317 12	6,441 66					14,943 12
Riverside	127,298 84	23,827 32	89,937 90	90,490 08			2,590 63	334,144 77
Sacramento	10,010 77	22,202 72	95,688 13	103,032 67			1,456 17	232,390 46

San Benito	1,976 54	2,737 12	14,340 80					19,054 46
San Bernardino	120,321 50	26,206 96	117,701 82	132,515 09	11,000 00	30,467 00	6,881 58	445,093 95
San Diego	78,948 17	35,358 32	165,977 51	156,336 59		30,352 50	1,893 26	468,866 35
San Francisco		58,876 96	304,440 00				232,576 29	595,893 25
San Joaquin	40,434 72	16,235 60	66,165 00	77,559 98			3,683 08	204,077 88
San Luis Obispo	3,237 16	7,588 48	26,781 68	39,842 30			124 15	77,573 77
San Mateo	52,404 59	9,864 60	28,452 32	64,188 72			3,404 64	158,314 87
Santa Barbara	28,778 52	11,905 60	43,995 00	59,918 00			13,658 12	158,255 24
Santa Clara	242,267 66	33,421 20	140,591 10	96,513 05			2,477 18	515,270 19
Santa Cruz	50,971 13	9,581 36	36,048 00	30,679 22			3,056 22	130,335 93
Shasta	25,289 10	5,831 36	19,722 65	19,789 68		36,114 25	854 13	107,601 17
Sierra	565 25	1,197 12		4,894 27				6,656 64
Siskiyou	18,403 70	6,738 48	27,668 63	17,455 73		75,318 33	597 57	146,182 44
Solano	24,833 06	11,752 72	35,698 25	61,412 61			960 55	134,657 19
Sonoma	43,862 03	18,209 84	67,495 00	48,410 96		101,929 67	3,198 96	283,106 46
Stanislaus	284,084 41	18,056 96	58,806 00	47,335 51	2,019 87		5,663 61	415,966 36
Sutter	5,300 01	2,027 12	5,241 51	11,724 62				24,293 26
Tehama	9,875 77	6,811 36	22,581 52	32,290 43			328 50	71,887 58
Trinity	1,867 22	1,427 12	5,053 95				9 00	8,357 27
Tulare	31,152 70	22,864 08	89,602 33	88,893 40			1,636 48	234,148 99
Tuolumne	4,138 38	3,974 24	27,431 92					35,544 54
Ventura	48,844 63	11,135 60	37,402 46	54,112 69			3,909 91	155,405 29
Yolo	15,913 08	6,961 36	23,725 18	26,608 06				73,207 68
Yuba	4,100 92	4,754 24	9,699 02	9,859 08			6,473 25	34,886 51
Totals	$2,780,993 32	$941,230 84	$3,911,872 16	$4,936,366 61	$60,657 94	$543,796 85	$672,696 72	$13,847,614 44

TABLE No. 20—Continued.

Statistics of Secondary (High) Schools, Showing Expenditures for All Purposes, by Counties, for Year Closing June 30, 1917.

Counties	Salary of teachers, 1916-17	Janitors and other employees, 1916-17	Current expenses, 1916-17	Books and apparatus, 1916-17	Laboratory supplies, 1916-17	Buildings, sites, furniture, 1916-17	Total expenditure, 1916-17	Balances on hand, July 1, 1917
Alameda	$517,331 24	$38,355 83	$91,673 38	$15,346 59	$19,300 95	$76,270 92	$758,278 91	$83,665 31
Alpine								
Amador	17,449 99	2,243 75	3,910 34	577 21	137 65	11,958 64	36,277 58	4,077 83
Butte	54,689 60	3,440 00	8,724 08	3,146 17	1,521 12	5,824 94	77,345 91	110,604 03
Calaveras	12,500 00	630 00	1,747 27	343 88	378 99	2,255 13	17,855 27	7,731 87
Colusa	32,000 00	3,468 24	5,496 60	569 89	436 90	4,190 60	46,162 23	13,949 88
Contra Costa	75,760 92	5,534 62	20,394 92	1,931 08	2,545 43	58,049 98	164,216 95	43,506 60
Del Norte	7,200 00	500 00	2,289 16	358 85	325 00	90 35	10,763 36	7,114 13
El Dorado	7,450 00	600 00	1,039 97	131 77	159 10	8,520 21	17,901 05	2,515 20
Fresno	209,780 42	19,501 07	47,242 47	11,359 74	8,324 46	125,704 44	421,912 60	78,005 14
Glenn	18,320 00	1,810 00	5,274 52	1,204 86	938 53	6,686 43	34,234 34	11,222 65
Humboldt	52,422 45	4,731 85	19,327 72	4,022 64	1,504 69	17,496 20	99,505 55	20,887 57
Imperial	77,416 72	13,216 77	21,790 72	2,928 01	3,357 47	112,588 39	231,298 08	24,559 70
Inyo	17,286 46	1,097 50	2,055 14	911 64	358 75	1,237 55	22,947 04	7,064 53
Kern	82,994 26	8,294 53	37,481 77	2,095 07	2,611 78	117,373 35	250,850 76	53,276 49
Kings	38,488 21	3,799 68	10,715 43	1,546 51	2,751 22	2,154 51	59,455 56	21,750 76
Lake	13,638 88	434 25	3,589 89	314 90	218 43	27,344 33	45,540 68	4,676 54
Lassen	10,140 03	1,413 15	1,331 90	320 97	244 28	292 24	13,742 57	5,168 79
Los Angeles	2,723,744 49	357,389 98	490,132 61	37,540 11	10,303 12	840,338 78	4,459,449 09	647,921 77
Madera	17,871 97	1,681 79	10,268 76	275 77	455 23	17,493 49	48,047 01	42,211 80
Marin	42,768 35	2,579 75	5,043 70	1,107 58	3,119 81	6,571 46	61,190 65	5,013 58
Mariposa	2,670 42	269 25	574 80	347 88	120 71	4,436 25	8,419 31	11,305 08
Mendocino	46,868 50	2,900 25	10,900 60	919 72	1,092 79	12,984 13	75,665 99	29,964 05
Merced	51,727 50	4,350 00	22,301 29	2,126 39	380 42	14,314 34	95,199 94	166,960 76
Modoc	18,573 75	1,424 90	2,654 45	595 32	559 38	729 55	24,537 35	4,152 01
Mono								
Monterey	48,035 48	4,024 50	12,178 03	1,590 70	1,943 46	11,882 74	79,654 91	12,426 25
Napa	29,680 00	2,593 54	4,252 92	952 64	773 58	4,481 06	42,733 74	21,634 98
Nevada	22,178 36	1,958 51	2,276 23	1,163 10	221 08	281 55	28,078 83	7,417 19
Orange	157,391 24	24,892 71	62,527 67	10,635 78	11,571 57	20,619 53	287,638 50	20,440 88
Placer	36,484 36	5,524 87	5,255 56	191 52	758 61	17,809 35	66,024 27	17,942 42
Plumas	5,600 00	900 00	1,281 94	776 70	58 34	12 00	8,628 98	5,686 38
Riverside	128,525 74	20,506 85	21,852 41	9,601 91	5,231 77	28,647 66	214,366 34	125,045 63
Sacramento	154,256 29	20,955 43	27,724 61	2,886 55	1,704 03	8,180 43	215,707 34	10,010 77

San Benito	12,130 00	900 00	3,000 00	400 00	440 78	42 00	16,912 78	1,976 54
San Bernardino	160,802 99	17,945 21	57,265 25	2,418 86	3,565 18	56,991 02	298,988 51	120,321 50
San Diego	229,947 04	24,614 43	57,929 46	4,944 61	1,568 25	14,091 83	333,095 62	78,948 17
San Francisco	339,372 90	30,350 85	30,433 13	33,896 28	3,225 00	45,435 66	482,713 82	15,138 66
San Joaquin	88,182 50	8,780 00	23,987 84	659 17	1,435 13	75,398 30	198,442 94	40,434 72
San Luis Obispo	35,089 06	3,315 19	8,325 51	1,386 57	954 36	25,424 37	74,495 06	3,237 16
San Mateo	48,196 75	5,466 00	14,829 94	2,670 49	346 31	61,055 11	132,564 60	52,404 59
Santa Barbara	75,561 50	7,914 50	13,652 38	6,215 45	2,421 56	5,472 12	111,237 51	28,778 52
Santa Clara	185,597 10	26,473 65	30,867 47	4,656 51	2,409 50	70,080 43	320,084 66	242,267 76
Santa Cruz	54,043 67	4,912 71	12,714 75	1,788 77	510 29	66,550 73	140,520 92	50,971 13
Shasta	27,821 63	4,190 00	3,941 01	1,528 79	1,081 76	6,759 98	45,323 17	25,289 10
Sierra	3,900 00	200 00	505 70	254 36	71 43	----------	4,931 49	565 25
Siskiyou	27,695 00	2,437 50	9,810 54	1,954 12	2,300 00	25,355 72	69,552 88	18,363 70
Solano	64,085 07	5,605 21	21,602 03	1,705 86	1,273 06	6,305 87	100,577 10	24,833 06
Sonoma	94,260 56	7,920 40	9,148 94	4,973 83	1,377 91	13,072 92	130,754 56	43,871 50
Stanislaus	78,127 44	7,797 88	18,859 51	4,105 89	2,905 39	16,612 52	128,408 63	286,134 21
Sutter	10,560 00	1,308 24	3,259 92	232 39	231 78	982 87	16,575 20	5,300 01
Tehama	28,982 32	2,420 00	8,075 14	2,106 51	577 76	92,300 60	134,462 33	9,875 77
Trinity	4,900 00	505 37	424 16	163 24	51 86	536 29	6,580 92	1,867 22
Tulare	130,911 41	11,285 18	17,332 81	5,996 35	5,671 20	60,228 57	231,425 52	33,391 91
Tuolumne	16,360 00	1,797 50	9,898 98	762 35	238 22	1,996 23	31,053 28	3,966 43
Ventura	61,003 83	6,704 00	13,170 24	888 67	2,736 00	4,659 08	89,161 82	48,844 63
Yolo	31,677 42	3,245 75	8,585 11	597 21	656 08	12,764 76	57,526 33	15,913 08
Yuba	20,290 00	1,023 50	4,373 28	429 84	274 17	1,504 57	27,895 36	4,100 92
Totals	$6,560,743 82	$748,136 64	$1,345,303 96	$202,557 57	$119,731 63	$2,230,442 08	$11,206,915 70	$2,784,706 11

TABLE No. 20—Continued.

Statistics of Secondary (High) Schools, Showing Expenditures for All Purposes for Year Closing June 30, 1918.

Counties	Salary of teachers	Janitors, gardeners and employees	Regular supplies	Sites, buildings, repairs, and furniture	For library books	Apparatus and equipment	Laboratory supplies	Transportation of pupils	Total expenditures, 1917-18	Balance on hand, June 30, 1918
Alameda	$631,119 81	$35,032 03	$129,580 54	$92,369 11	$7,479 92	$38,454 78	$2,901 23	$1,489 50	$938,426 92	$18,197 01
Alpine	------	------	------	------	------	------	------	------	------	------
Amador	20,263 90	3,123 60	3,824 31	11,166 76	891 72	15 95	573 26	2,502 14	42,361 64	3,782 52
Butte	53,586 60	3,027 60	6,657 65	61,335 65	917 75	9 10	916 49	373 24	126,824 08	63,020 38
Calaveras	12,242 00	694 50	1,189 44	38 06	212 75	187 50	224 32	725 03	15,513 60	5,918 17
Colusa	35,309 69	4,035 52	4,666 02	3,529 08	875 98	270 29	418 39	1,324 09	50,429 06	10,731 68
Contra Costa	78,326 26	6,600 01	23,541 06	37,355 19	1,698 69	1,461 73	826 58	------	149,809 52	60,892 23
Del Norte	6,310 00	500 00	1,719 24	2,069 25	248 31	90 53	300 00	1,258 50	12,495 83	5,108 95
El Dorado	8,135 00	660 00	1,496 33	2,218 48	59 03	607 25	365 23	------	13,541 32	2,969 11
Fresno	246,256 51	19,437 37	47,817 07	96,450 33	4,007 18	14,421 44	10,893 64	10,344 24	449,627 78	110,119 58
Glenn	23,055 00	2,386 13	4,729 16	6,837 81	515 47	2,441 95	863 82	2,479 87	43,309 21	31,439 22
Humboldt	64,220 42	6,086 63	13,088 50	24,595 23	1,165 61	3,921 32	3,034 10	10,630 40	126,742 21	68,407 51
Imperial	83,889 02	12,157 60	25,827 79	17,054 64	1,432 15	212 15	3,655 10	17,979 98	162,208 43	11,408 41
Inyo	18,947 60	1,126 00	3,001 76	402 13	162 10	------	550 76	286 00	24,776 35	10,569 67
Kern	93,913 88	10,214 97	25,439 35	94,467 65	2,968 78	20,953 72	1,246 60	27,368 30	276,573 25	75,544 24
Kings	40,580 38	3,462 58	8,274 73	13,040 59	1,253 05	1,241 10	------	------	67,852 43	19,299 38
Lake	16,500 00	607 50	2,532 45	11,838 68	122 49	------	921 11	------	32,522 23	6,269 09
Lassen	10,598 30	943 75	1,616 37	1,691 66	29 36	284 84	------	881 25	16,045 53	4,149 03
Los Angeles	2,488,956 11	368,768 92	472,169 09	433,072 05	23,199 55	50,793 21	11,554 27	20,420 16	3,868,933 36	567,261 46
Madera	25,437 29	3,027 76	6,357 54	48,780 04	117 10	1,338 01	338 19	4,486 01	89,881 94	9,563 42
Marin	49,824 73	3,156 60	8,233 76	11,379 51	655 02	279 44	590 70	135 50	74,255 26	2,269 32
Mariposa	3,800 00	200 00	327 66	10,220 15	74 78	------	------	------	14,622 59	479 36
Mendocino	52,152 60	3,164 00	20,994 17	15,785 71	787 32	42 50	1,629 10	2,589 20	97,144 60	28,144 99
Merced	50,013 67	5,904 36	14,140 48	7,157 78	767 09	1,256 00	563 67	5,393 11	85,196 16	188,001 77
Modoc	19,367 50	1,735 00	3,918 38	1,705 47	91 41	904 67	521 64	------	28,244 07	16,854 73
Mono	------	------	------	------	------	------	------	------	------	------
Monterey	52,753 64	4,954 60	8,753 51	12,335 50	1,281 86	3,225 74	695 12	5,869 55	89,869 52	9,747 01
Napa	32,610 00	2,604 94	2,768 25	10,090 60	884 69	1,938 58	1,622 06	------	52,519 12	22,689 56
Nevada	23,751 56	1,752 80	3,530 22	10,282 14	155 48	1,644 85	167 89	381 04	41,665 98	5,063 02
Orange	171,069 12	28,361 63	32,315 07	30,011 44	3,846 23	2,181 47	13,403 94	9,612 01	290,800 91	37,687 95
Placer	36,626 47	3,887 07	4,813 56	14,321 74	504 28	------	1,220 87	2,734 52	64,108 51	19,608 61
Plumas	5,800 00	900 00	2,714 85	3,277 75	194 40	1,623 94	110 73	------	14,621 67	321 45
Riverside	156,069 36	19,936 24	18,110 13	41,370 99	3,683 31	3,546 02	6,226 29	6,418 73	255,361 07	78,783 70
Sacramento	155,503 27	22,329 18	16,746 65	11,843 32	1,325 26	4,315 36	4,429 33	6,067 95	222,560 32	9,830 14

San Benito	13,305 00	1,264 70	3,271 42	180 00	215 00	150 00	----------	580 00	18,966 12	88 34
San Bernardino	194,523 23	25,735 70	35,361 90	15,561 13	2,742 69	4,845 51	4,164 11	13,041 91	295,976 18	149,117 77
San Diego	241,120 89	28,563 40	27,080 98	46,414 17	4,250 32	2.989 57	1,121 17	9,106 76	360,647 27	108,219 00
San Francisco	388.383 75	24,107 25	10,021 76	167,876 01	1,038 32	----------	4,466 16	----------	595,893 25	----------
San Joaquin	101,666 10	10,355 00	25,535 53	34,741 51	520 11	899 10	1,715 00	4,347 04	179,779 39	24,298 49
San Luis Obispo	46,405 97	3,976 47	5,969 58	3,572 27	657 03	217 74	1,424 09	4,028 94	66,252 09	11,321 68
San Mateo	52,082 00	7,579 40	13,207 55	47,305 77	1,021 28	4,862 12	1,028 05	1,255 50	128,341 67	29,973 20
Santa Barbara	87,780 83	9.117 85	12,858 55	2,402 60	3,493 53	----------	1,208 83	1,680 95	118,543 14	39,712 10
Santa Clara	193.061 36	26,646 92	17,157 85	109,828 38	2,652 37	2,114 12	4,346 86	4,964 74	360,772 60	154,497 59
Santa Cruz	57,573 58	7,851 29	9,006 30	47,599 84	512 13	1,393 72	88 24	1,999 27	126,024 37	4,311 58
Shasta	33,577 15	1,410 00	10,496 86	28,870 27	319 13	102 82	601 15	4,250 25	79,627 63	27,973 54
Sierra	4,530 00	231 65	200 65	311 50	335 97	33 38	92 54	----------	5,735 69	920 95
Siskiyou	31,985 55	2,810 00	5,449 38	90,302 24	512 80	850 00	1,077 35	----------	132,987 32	13,195 12
Solano	66,766 63	6,158 87	11,837 11	6,767 32	1,614 79	2,368 61	850 69	4,116 05	100,480 07	34,177 12
Sonoma	95,031 60	9,421 00	6,457 08	82,017 50	990 97	1,485 10	3,271 89	3,852 35	202,527 49	80,578 97
Stanislaus	96,518 08	9,631 10	21,651 01	156,458 57	1,065 03	750 29	2,866 57	5,204 85	294,145 50	121,820 85
Sutter	11,270 00	1,533 28	2,072 12	12,816 69	54 99	387 99	333 53	3,211 21	31,679 81	*7,386 55
Tehama	34,299 74	2,324 40	6,175 84	17,329 90	432 10	----------	1,656 43	1,615 74	63,834 15	8,053 43
Trinity	5,100 00	341 05	499 46	466 76	150 00	123 04	67 76	----------	6,748 07	1,609 20
Tulare	136,584 89	10,363 41	16,672 58	13,471 58	3,347 16	3,549 91	5,507 82	6,783 90	196.281 25	37,867 74
Tuolumne	17,210 00	1,950 00	1,520 10	1,635 50	----------	1,189 60	584 44	1,941 62	26.031 28	9,513 28
Ventura	65,053 69	6,626 40	9,861 67	13,100 81	1,012 66	233 95	2,960 75	3,662 67	102,512 60	52.892 69
Yolo	34,109 43	4,125 60	4,875 66	15,696 22	630 57	4,046 67	866 91	2,264 25	66,615 31	6,592 37
Yuba	21,800 00	1,967 70	5,373 67	1,082 66	100 00	1,341 84	615 78	800 00	33,081 65	1,804 86
Totals	$6,796,729 16	$784,871 34	$1,183,509 70	$2,053,903 69	$89,577 07	$191,598 52	$111,680 55	$220,458 32	$11,432,328 35	$2,415,286 09

*Overdraft.

TABLE No. 20—Continued.

Statistics of Secondary (High) Schools, Showing Valuation of Property, Outstanding Bonded Debts, Number of Books in High School Libraries for School Year Closing June 30, 1917.

Counties	Valuation of lots, buildings, and furniture	Valuation of laboratories	Valuation of books and apparatus	Total valuation	Total outstanding bonded debt	Number of books in high school libraries
Alameda	$2,111,563	$64,807	$56,208	$2,232,578	$151,000	39,550
Alpine	----------	----------	----------	----------	----------	----------
Amador	80,367	2,550	2,750	85,667	----------	2,006
Butte	115,000	5,800	5,550	126,350	3,000	3,930
Calaveras	11,750	900	2,000	14,650	----------	1,654
Colusa	93,000	5,000	5,700	103,700	46,000	5,349
Contra Costa	288,000	17,200	10,200	315,400	97,500	7,012
Del Norte	13,500	3,200	1,800	18,500	----------	2,350
El Dorado	34,000	1,100	2,000	37,100	----------	1,451
Fresno	719,988	43,312	23,755	787,055	197,000	19,324
Glenn	157,000	6,000	2,200	165,200	86,000	1,905
Humboldt	211,500	6,450	7,500	225,450	171,600	6,852
Imperial	582,942	18,156	10,223	611,321	420,000	4,145
Inyo	31,425	3,000	3,300	37,725	11,500	1,795
Kern	429,900	9,020	10,800	449,720	164,000	4,186
Kings	146,000	11,248	5,100	162,348	45,000	5,672
Lake	33,950	1,800	1,010	36,760	----------	1,447
Lassen	36,000	1,600	1,100	38,700	----------	1,153
Los Angeles	8,974,451	244,385	283,785	9,502,621	5,734,750	119,429
Madera	72,133	2,000	1,750	75,883	50,000	1,300
Marin	104,500	5,430	13,680	123,610	42,000	4,582
Mariposa	13,655	210	712	14,577	12,000	280
Mendocino	91,950	7,850	7,425	107,225	7,400	6,437
Merced	190,950	12,050	14,600	217,600	183,000	10,626
Modoc	65,590	1,325	3,235	70,180	----------	1,860
Mono	----------	----------	----------	----------	----------	----------
Monterey	194,163	6,600	7,050	207,816	23,000	4,748
Napa	97,200	5,350	6,200	108,750	45,500	4,137
Nevada	31,100	2,000	2,300	35,400	26,250	1,218
Orange	840,450	42,050	57,108	939,608	544,000	19,438
Placer	140,000	6,500	6,500	153,000	58,000	3,672
Plumas	49,000	600	1,750	51,350	----------	----------
Riverside	534,720	35,600	15,242	585,562	447,000	12,564
Sacramento	607,203	8,800	10,460	626,436	----------	----------
San Benito	50,000	2,500	1,500	54,000	15,000	620
San Bernardino	919,500	18,400	26,750	964,650	537,000	22,561
San Diego	753,148	25,095	18,913	797,156	352,350	18,830
San Francisco	3,109,114	47,127	33,896	3,190,137	500,000	7,585
San Joaquin	630,494	6,038	5,731	642,263	326,000	5,062
San Luis Obispo	104,500	3,600	6,200	114,300	35,000	3,748
San Mateo	394,924	6,637	10,230	411,791	242,000	8,622
Santa Barbara	221,000	8,350	12,100	241,450	12,600	12,255
Santa Clara	498,983	28,107	19,341	546,431	459,500	17,183
Santa Cruz	341,700	3,600	9,850	355,150	170,000	4,249
Shasta	76,820	3,400	3,650	83,870	----------	3,360
Sierra	800	200	1,500	2,500	----------	814
Siskiyou	60,900	4,100	2,500	67,500	----------	1,637
Solano	322,300	9,500	10,700	342,500	221,000	7,743
Sonoma	322,300	12,325	8,225	342,850	200,500	8,447
Stanislaus	277,492	10,150	10,450	298,092	348,800	8,455
Sutter	36,500	1,500	1,600	39,600	12,000	950
Tehama	173,762	2,800	2,780	179,342	142,000	2,264
Trinity	9,800	395	860	11,055	----------	800
Tulare	382,717	24,730	17,100	424,547	226,750	8,343
Tuolumne	96,000	1,700	3,000	100,700	16,000	4,299
Ventura	303,600	15,050	8,265	326,915	167,000	6,890
Yolo	203,500	5,675	3,350	212,525	126,000	3,862
Yuba	76,000	1,300	2,850	80,150	35,000	2,040
Totals	$26,468,807	$824,172	$804,364	$28,097,343	$12,710,000	460,751

TABLE No. 20—Continued.

Statistics of Secondary (High) Schools, Showing Valuation of Property, Amount of Outstanding Bonded Debts, Number of Books in High School Libraries for School Year Closing June 30, 1918.

Counties	Valuation of lots, buildings, and furniture	Valuation of laboratories	Valuation of books and apparatus	Total valuation	Total outstanding bonded debt	Number of volumes in high school library card
Alameda	$2,106,645	$130,982	$56,236	$2,293,863	$128,750	44,877
Alpine	----------	----------	----------	----------	----------	----------
Amador	82,192	12,148	2,481	96.821	----------	2,948
Butte	203,800	12,500	4,550	220,850	81,000	4,050
Calaveras	7,800	2,300	1,800	11,900	----------	1,736
Colusa	89,000	12,950	5,550	107.500	42,500	4,870
Contra Costa	309,800	37,135	11,000	357,935	91,500	7,580
Del Norte	13,000	3,200	2,000	18,200	----------	1,975
El Dorado	34,000	5,000	2,000	41,000	----------	1,504
Fresno	871,160	136,837	24,653	1,032,650	284,500	20,612
Glenn	161,000	18,820	1,475	181,295	103,000	1,698
Humboldt	219,825	17,150	7,000	243,975	210,000	9,124
Imperial	560,000	48,748	4,950	613.698	420,500	3,862
Inyo	30,000	4,435	3,265	37,700	10,350	1,902
Kern	463,256	67,250	9,150	539,656	160,000	8,544
Kings	145,300	18,500	4,050	167,850	45,000	4,950
Lake	38,500	7,300	1,150	46.950	35,000	1,915
Lassen	36,000	1,750	1,125	38,875	----------	1,179
Los Angeles	8,293,392	1,336,624	159,510	9,789,526	5,668,250	133,149
Madera	120,133	5,450	1,705	127.288	50,000	1,373
Marin	96,000	33,700	2.200	131,900	41,000	5,730
Mariposa	18,000	2,290	600	20,890	11,400	410
Mendocino	101,600	20,605	9,300	131,505	6,500	8,282
Merced	185,650	32,400	9,500	227,550	199,500	11.031
Modoc	66,500	1,810	3,375	71,685	15,000	2,271
Mono	----------	----------	----------	----------	----------	----------
Monterey	142,000	24,650	6,250	172,900	21,000	5,400
Napa	94,800	20,000	6 500	121,300	----------	4,623
Nevada	39,000	5,450	1.700	46,150	24,750	1,316
Orange	802,750	136,400	31 600	970,750	518,250	22.860
Placer	146,500	18,100	12,900	177,500	58,000	4,568
Plumas	42,000	7,700	3,500	53,200	----------	2,261
Riverside	534,250	77,690	13,600	625,540	424,500	14,512
Sacramento	524,000	90,356	11.400	625.756	173,000	7,008
San Benito	50,000	4.000	1.500	55,500	12,000	800
San Bernardino	886,100	81,350	27,136	994,586	622,500	25,231
San Diego	766,883	46,575	16,991	830.449	364,050	20,570
San Francisco	2.621,429	154,110	6 230	2,781,769	1,553,560	6 753
San Joaquin	615,207	29,121	5,998	650,326	321,000	5,587
San Luis Obispo	104,500	13,150	5,650	123,300	35,000	4,191
San Mateo	466,000	24.550	7.600	498.150	230,000	9,463
Santa Barbara	206,000	53,575	15,700	275.275	11,600	14,228
Santa Clara	690,467	105,239	16.600	812.306	443,250	18,933
Santa Cruz	330,000	31,100	7,950	369.050	235,000	4,490
Shasta	123,120	14,200	2,520	139.840	35,000	3,504
Sierra	4,900	1.000	300	6 200	----------	900
Siskiyou	131,500	7,750	2,150	141.400	75,400	1,500
Solano	310,000	25,300	10,700	346,000	212.000	8,512
Sonoma	399,050	13,950	10,197	423.197	294.000	8.555
Stanislaus	419,942	29,200	10,325	459.467	344.400	9,199
Sutter	48.500	4,850	1.650	55,000	10,000	975
Tehama	186,000	12,150	2.250	200 400	136,000	2.331
Trinity	10,000	400	850	11.250	----------	800
Tulare	362,000	72,600	9,150	443.750	220,000	10.799
Tuolumne	97,000	2,800	3,775	103.575	15.000	4.325
Ventura	300,000	34,300	8.000	342 300	158 000	6,996
Yolo	190,300	17,800	2,150	210 250	122.000	2,880
Yuba	81,082	1,913	2.950	85,945	33.000	1,854
Totals	$25,977,833	$3,131,213	$594,397	$29,703,443	$14,346,010	521,496

TABLE No. 21.

Statistics of Secondary (High) Schools, Showing Rate of County Tax, Average Rate of District Tax for Maintenance and for Buildings, Average Rate of Interest Paid on Outstanding Bonds, and Average Rate per Pupil for School Years Ending June 30, 1917 and 1918.

Counties	Rate of county tax for high schools		Average rate of district tax				Average rate of interest paid on bonds issued		Average cost per pupil, not including cost of buildings, for maintenance of schools		
			For maintenance		For building				On enrollment		*On average attendance
	1916-17	1917-18	1916-17	1917-18	1916-17	1917-18	1916-17	1917-18	1916-17	1917-18	1917-18
Alameda	0.16	0.171	0.14	0.16	-------	-------	-------	0.07	$50 60	$40 26	$113 53
Alpine	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------
Amador	.20	.20	.216	.30	0.10	0.47	0.05	.05	126 66	136 45	173 41
Butte	.24	.20	.145	.12	-------	.40	.05	.05	80 54	69 74	91 72
Calaveras	.11	.11	.02	.10	.09	-------	-------	-------	113 35	131 14	159 74
Colusa	.09	.07	.17	.19	-------	-------	.07	.05	184 90	224 40	272 67
Contra Costa	.095	.10	.227	.25	.045	-------	.05	.05	117 31	120 27	143 80
Del Norte	.19	.17	-------	-------	-------	-------	-------	-------	177 85	165 50	182 92
El Dorado	.10	.10	.17	.17	-------	-------	-------	-------	78 82	87 09	105 82
Fresno	.15	.14	.298	.36	-------	-------	.05	.053	97 30	115 98	137 96
Glenn	.08	.09	.13	.25	-------	-------	.055	.053	100 17	92 11	121 34
Humboldt	.1275	.1405	.446	.301	-------	.099	.05	.05	59 47	79 30	130 62
Imperial	.16	.16	.265	.46	-------	-------	-------	-------	85 77	105 58	215 04
Inyo	.10	.20	.16	.13	-------	-------	-------	-------	111 90	122 79	152 94
Kern	.05	.05	.24	.35	-------	-------	-------	.06	147 48	127 93	198 37
Kings	.13	.15	.28	.316	-------	-------	.05	.05	121 33	94 34	164 10
Lake	.22	.22	.11	.29	-------	-------	.05	.05	118 67	116 00	136 06
Lassen	.08	.09	.16	.094	-------	-------	-------	-------	120 55	110 46	142 11
Los Angeles	.14	.1404	.361	.386	-------	-------	.05	.05	87 75	84 84	180 81
Madera	.067	.073	.183	.27	-------	.13	.05	-------	175 59	173 42	200 49
Marin	.11	.13	.23	.26	-------	.15	.05	.05	100 00	99 96	139 86
Mariposa	.09	.066	.09	.18	-------	-------	.05	.04	164 64	167 97	218 36
Mendocino	.185	.185	.20	.22	-------	-------	.0525	.0525	113 55	111 15	148 73
Merced	.10	.10	.21	.19	-------	-------	.05	.055	214 55	166 39	196 08
Modoc	.10	.10	.153	.15	-------	-------	-------	.06	132 26	138 22	171 21
Mono	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------
Monterey	.10	.10	.16	-------	-------	-------	-------	-------	114 48	118 55	151 13
Napa	.14	.13	.22	.18	-------	-------	.05	.05	113 35	114 91	145 48
Nevada	.30	.30	.10	.29	.25	-------	.055	.05	72 20	80 06	91 23
Orange	.25	.21	.44	.10	.10	-------	.05	.05	143 09	110 78	140 89
Placer	.20	.20	.53	.446	-------	.10	.06	.05	144 35	154 21	197 70
Plumas	.15	.10	-------	.33	-------	-------	-------	-------	200 67	231 50	378 13
Riverside	.30	.30	.35	-------	.28	-------	.04	.046	146 92	116 28	192 87
Sacramento	.107	.112	.12	.38	-------	-------	.052	.0516	127 60	45 00	133 11
San Benito	.15	.15	.15	.232	-------	-------	.045	-------	98 00	106 00	125 00
San Bernardino	.26	.278	.39	.15	-------	-------	.05	.05	113 00	78 83	140 84
San Diego	.21	.21	-------	.44	-------	.18	-------	.052	48 47	46 60	135 91
San Francisco	.056	.0549	.0246	.054	.0063	.0278	.045	.049	47 20	48 64	90 05
San Joaquin	.095	.11	.150	.27	-------	-------	.054	.054	109 57	41 25	110 80
San Luis Obispo	.11	.08	.472	.545	-------	-------	.055	.053	126 09	89 32	176 93
San Mateo	.07	.087	.148	.242	-------	-------	.041	.049	99 78	89 40	152 03
Santa Barbara	.14	.13	.255	.287	-------	-------	.055	.055	116 35	124 48	173 86
Santa Clara	.187	.177	.248	.2706	.098	.091	.048	.048	90 22	60 45	121 34
Santa Cruz	.195	.20	.275	.286	-------	-------	.05	-------	113 27	84 69	117 57
Shasta	.127	.124	.23	.173	-------	.14	-------	.05	139 21	117 22	175 02
Sierra	.15	.08	.15	.175	-------	-------	-------	-------	234 83	168 44	201 04
Siskiyou	.085	.106	.25	.248	.12	-------	-------	.06	134 00	114 13	175 66
Solano	.15	.14	.245	.255	.105	-------	.05	.05	133 15	127 67	173 22
Sonoma	.17	.185	.27	.246	-------	-------	-------	.05	87 99	95 34	113 04
Stanislaus	.20	.20	.44	.366	-------	.08	.05	.051	113 91	111 39	133 67
Sutter	.10	.10	.105	.175	-------	-------	-------	.06	143 05	158 51	184 93
Tehama	.15	.15	.15	.40	-------	.15	.05	.05	93 48	86 57	114 18
Trinity	.15	.15	-------	-------	-------	-------	-------	-------	125 92	165 29	209 36
Tulare	.20	.20	.395	.433	-------	-------	.06	-------	118 48	108 03	140 60
Tuolumne	-------	.18	.29	-------	-------	-------	.05	.05	149 73	115 06	128 37
Ventura	.13	.124	.282	.288	.13	-------	.05	.05	120 03	130 72	157 14
Yolo	.104	.1061	.17	.303	-------	-------	.05	.05	104 10	123 83	149 93
Yuba	.10	.10	.25	.225	-------	-------	.045	.045	100 71	117 60	131 60
Averages	0.144	0.144	0.2281	0.269	0.1203	0.168	0.0523	0.0504	$79 84	$73 82	$144 82

*No report for 1917.

TABLE No. 22.

Statistics of Secondary (High) Schools, Showing Number of Principals, Teachers and Average Annual Salary Paid Each Class for School Year Closing June 30, 1917.

Counties	Number and average salary paid principals				Number and average salary paid regular teachers				Number and average salary paid special teachers			
	No.	Men	No.	Women	No.	Men	No.	Women	No.	Men	No.	Women
Alameda	14	$2,094 28	------	------	109	$1,412 84	174	$1,500 00	53	$639 14	53	$706 78
Alpine	------	------	------	------	------	------	------	------	------	------	------	------
Amador	3	1,650 00	------	------	1	1,225 00	6	1,175 00	1	1,200 00	3	1,133 00
Butte	4	2,175 00	------	------	9	1,344 00	20	1,162 50	5	1,220 00	4	1,050 00
Calaveras	2	1.800 0)	------	------	2	1,400 00	5	1,220 00	------	------	------	------
Colusa	5	1,940 00	------	------	4	1,305 00	16	1,140 00	------	------	------	------
Contra Costa	6	2.296 00	1	$1,500 00	1	1,350 00	30	1,249 26	6	1,423 33	8	962 50
Del Norte	1	1,800 00	------	------	------	------	3	1,063 00	1	1,150 00	1	1,050 00
El Dorado	1	1.750 00	------	------	------	------	4	1,125 00	1	1.200 00	------	------
Fresno	11	2,090 90	2	1,687 50	46	1,458 69	60	1,209 52	22	1,447 72	10	1,310 00
Glenn	2	2,160 00	------	------	4	1,325 00	6	1,063 67	1	1,300 00	1	1,000 00
Humboldt	5	1,924 00	------	------	6	1,314 63	23	1,174 17	4	1,385 00	3	1,130 00
Imperial	5	2,546 00	------	------	12	1,375 63	19	1,249 56	10	1,274 79	12	1,073 22
Inyo	4	1,650 00	------	------	2	1,225 00	6	1,019 00	------	------	2	1,095 00
Kern	5	1,920 00	1	2,000 00	18	1,500 00	23	1,145 87	9	1,450 00	4	1,102 50
Kings	3	2,033 33	------	------	5	1,400 00	13	1,225 00	4	1,350 00	3	1,063 66
Lake	3	1,633 67	------	------	2	1,250 00	6	1,041 67	------	------	------	------
Lassen	1	1,800 00	------	------	3	1,200 00	4	1,091 25	------	------	------	------
Los Angeles	41	2,490 34	2	2,850 00	294	1,626 49	601	1,494 97	224	1,452 17	368	1,506 66
Madera	3	1,653 33	------	------	1	1,300 00	8	1,128 00	1	1,300 00	1	1,200 00
Marin	3	1,633 33	------	------	3	1,660 00	14	1,284 30	8	1,196 25	5	850 40
Mariposa	1	1,600 00	------	------	------	------	1	1,037 50	------	------	------	------
Mendocino	8	1,701 25	------	------	7	1,208 57	20	1,113 50	3	773 33	------	------
Merced	6	1,983 33	------	------	6	1,450 00	19	1,130 78	3	963 67	6	1,058 33
Modoc	3	2,040 00	------	------	1	1,150 00	7	1,043 00	1	1,250 00	3	917 92
Mono	------	------	------	------	------	------	------	------	------	------	------	------
Monterey	5	2,122 00	------	------	6	1,517 00	19	1,207 00	5	1,430 00	4	700 00
Napa	3	1,963 63	------	------	4	1,500 00	11	1,136 36	1	1,500 00	6	971 61
Nevada	3	1,950 00	------	------	3	1.282 00	10	1,110 00	1	1,200 00	1	1,000 00
Orange	5	2,393 20	------	------	35	1,320 55	47	1,034 95	14	1,461 42	17	1.205 88
Placer	3	2,133 33	------	------	8	1,393 75	15	1,290 00	------	------	2	650 00
Plumas	1	2.000 00	------	------	------	------	2	1,150 00	1	1,300 00	------	------
Riverside	11	1,916 00	1	1,450 00	27	1,393 03	37	1,077 00	16	1,246 25	17	854 00

TABLE No. 22—Continued.

Statistics of Secondary (High) Schools, Showing Number of Principals, Teachers and Average Annual Salary Paid Each Class for School Year Closing June 30, 1917.

Counties	Number and average salary paid principals				Number and average salary paid regular teachers				Number and average salary paid special teachers			
	No.	Men	No.	Women	No.	Men	No.	Women	No.	Men	No.	Women
Sacramento	6	$2,004 15			36	$1,594 11	59	$1,409 30			2	$1,200 00
San Benito	1	2,400 00			3	1,333 00	4	1,250 00				
San Bernardino	8	1,831 25			23	1,489 73	34	1,289 29	26	1,353 04	30	1,140 50
San Diego	10	1.814 40	1	1,500 00	48	1,511 46	72	1,337 43	44	1,393 58	38	1,403 04
San Francisco	8	2,475 00			63	1,514 69	75	1.680 80	41	1,175 12	51	1,309 41
San Joaquin	5	2,150 00			14	1,887 00	24	1,219 00	10	1,646 00	10	1,098 00
San Luis Obispo	4	1,925 00			8	1,381 25	10	1,180 00	1	1,450 00	4	954 50
San Mateo	4	2,115 00			4	1,787 50	12	1,341 67	5	1,592 00	9	1,043 33
Santa Barbara	5	2,095 00			12	1,550 00	18	1,411 00	8	1,250 00	8	753 12
Santa Clara	8	2,412 50			21	1,545 71	60	1,266 68	17	1,429 31	33	1,070 46
Santa Cruz	3	2,133 00			11	6,481 81	22	4,328 40	1	1,250 00	3	793 75
Shasta	3	1,963 33			4	1,175 00	9	1,069 44	5	1,480 00	1	1,050 00
Sierra	1	1,500 00					2	1,200 00				
Siskiyou	4	1,532 50			7	1,328 57	9	921 67	1	1,400 00	2	1,275 00
Solano	6	2,163 65			8	1,308 12	24	1,208 54	4	1,187 50	8	1,041 82
Sonoma	6	2,008 00	1	1,000 00	7	1,543 00	35	1,257 00	8	1,096 00	6	1,258 00
Stanislaus	8	2,083 75			13	1,284 61	32	1,097 27	6	1,325 00	9	1,094 44
Sutter	1	1,900 00			4	1,275 00	3	1,233 33				
Tehama	3	1,900 00			6	1,283 00	13	1,169 00	1	427 50		
Trinity	1	1,600 00					2	1.100 00	1	1,100 00		
Tulare	9	2,086 66			21	1,309 52	42	1,140 09	9	1,166 66	12	1,329 92
Tuolumne	2	1.900 00			1	1,250 00	6	1,066 66	3	1,333 33	1	1,000 00
Ventura	4	2,612 50			7	1,483 00	19	1,258 55	9	987 78	7	1,088 57
Yolo	2	2,000 00	1	1,600 00	3	1,341 67	14	1,178 57	3	1.166 67	4	472 50
Yuba	2	1,822 50			4	1,517 50	5	1,080 00	2	1,360 00	3	816 66
Totals	285	†$2,084 21	10	†$1,812 50	950	†$1,538 90	1,834	†$1,380 01	600	†$1,270 16	775	†$1,252 09

†Average.

TABLE No. 22—Continued.

Statistics of Secondary (High) Schools, Showing Number of Principals, Teachers, and Average Annual Salary Paid Each Class for School Year Closing June 30, 1918.

Counties	Number and average salary paid principals				Number and average salary paid regular teachers				Number and average salary paid special teachers			
	No.	Men	No.	Women	No.	Men	No.	Women	No.	Men	No.	Women
Alameda	16	$1,865 00			99	$1,241 50	200	$1,554 50	111	$891 40	118	$942 00
Alpine												
Amador	3	1,750 00			1	1,250 00	9	1,023 45	1	1,100 00	2	1,150 00
Butte	4	2,175 00			9	1,463 63	21	1,161 71	4	1,150 00	4	1,101 00
Calaveras	2	1,850 00			2	1,400 00	5	1,150 00				
Colusa	5	1,910 00			4	1,400 00	16	1,219 00				
Contra Costa	5	2,326 00	2	$1,850 00	3	1,540 00	35	1,231 45	6	1,316 63	9	960 55
Del Norte	1	1,850 00					4	1,025 00	1	360 00		
El Dorado	1	1,520 00			1	1,092 50	3	1,124 16	1	1,200 00	1	950 00
Fresno	12	2,125 00	2	1,737 50	47	1,506 00	68	1,297 00	24	1,533 00	17	1,325 00
Glenn	2	2,250 00	1	1,700 00	3	1,400 00	9	1,155 56	2	830 00	1	1,100 00
Humboldt	5	2,110 80			3	1,819 00	31	1,136 77	7	1,516 28	5	1,212 40
Imperial	5	2,450 00			15	1,014 72	28	1,059 47	8	1,103 77	18	924 82
Inyo	3	1,828 00	1	1,080 00	2	1,300 00	7	1,072 85			2	1,150 00
Kern	6	2,250 00			22	1,604 00	32	1,238 51	4	1,255 00	1	1,187 50
Kings	3	2,233 33			5	1,530 00	12	1,283 33	5	1,380 00	3	1,083 33
Lake	3	1,763 66			1	1,300 00	8	1,062 50	1	1,400 00		
Lassen	1	1,800 00			3	1,220 00	4	1,113 75				
Los Angeles	36	2,866 73	2	3,200 00	275	1,677 51	622	1,519 02	229	1,533 59	397	1,459 12
Madera	3	1,850 00			3	1,333 33	9	1,162 22	2	900 00	4	975 00
Marin	3	1,963 63			4	1,575 00	17	1,302 29	8	1,367 50	6	794 66
Mariposa	1	1,600 00					2	1,100 00				
Mendocino	8	1,843 75			3	1,163 63	22	1,119 31	6	1,101 66	3	970 00
Merced	6	2,050 00			5	1,440 00	20	1,230 00	3	1,188 33	5	901 00
Modoc	2	2,100 00	1	1,505 00	1	1,400 00	8	1,095 31	1	1,250 00	2	1,075 00
Mono												
Monterey	5	2,134 00			6	1,517 00	19	1,246 00	5	1,450 00	6	1,043 00
Napa	3	2,083 33			5	1,360 00	11	1,187 27	1	1,500 00	6	841 66
Nevada	3	1,950 00			3	1,353 00	10	1,130 00	1	1,300 00	1	1,000 00
Orange	5	2,420 00			29	1,457 75	52	1,268 27	18	1,375 30	24	1,283 33
Placer	3	2,133 33			7	1,407 14	12	1,191 63	3	1,400 00	6	860 00
Plumas	1	2,000 00			1	1,200 00	7	1,200 00	1	1,400 00		
Riverside	11	2,114 00			28	1,457 00	44	1,210 00	16	1,279 00	18	971 00

TABLE No. 22—Continued.

Statistics of Secondary (High) Schools, Showing Number of Principals, Teachers, and Average Annual Salary Paid Each Class for School Year Closing June 30, 1918.

Counties	Number and average salary paid principals				Number and average salary paid regular teachers				Number and average salary paid special teachers			
	No.	Men	No.	Women	No.	Men	No.	Women	No.	Men	No.	Women
Sacramento	6	$2,016 67	------	------	21	$1,461 77	46	$1,397 84	19	$1,455 00	17	$1,188 76
San Benito	1	2,400 00	------	------	3	1,416 00	4	1,275 00	1	1,450 00	1	900 00
San Bernardino	8	2,362 00	------	------	27	1,500 00	45	1,262 00	22	1,351 00	33	1,207 00
San Diego	13	1,678 77	------	------	40	1,540 17	73	1,377 43	39	1,377 15	39	1,228 87
San Francisco	8	2,437 50	------	------	56	1,685 00	76	1,657 76	46	1,178 04	62	1,387 99
San Joaquin	4	2,125 00	------	------	13	1,642 04	30	1,257 92	17	1,370 60	12	914 23
San Luis Obispo	4	2,200 00	------	------	9	1,391 11	15	1,127 66	1	1,500 00	5	1,115 00
San Mateo	3	2,616 66	------	------	3	1,916 66	14	1,218 21	5	1,590 00	8	1,303 12
Santa Barbara	4	2,268 75	1	$2,100 00	14	1,407 14	23	1,350 00	9	1,277 77	4	950 00
Santa Clara	8	2,481 25	1	1,700 00	19	1,647 64	64	1,282 17	22	1,188 19	28	1,178 49
Santa Cruz	4	1,600 00	------	------	9	1,411 11	19	1,218 42	5	1,220 00	6	1,233 00
Shasta	3	2,033 33	------	------	4	1,282 50	13	1,083 46	5	1,504 00	------	------
Sierra	1	1,700 00	------	------	------	------	3	1,066 67	------	------	------	------
Siskiyou	4	1,606 45	------	------	8	1,356 25	9	1,097 22	1	1,400 00	5	1,005 00
Solano	6	2,200 00	------	------	7	1,453 50	26	1,252 58	2	1,450 00	8	1,067 50
Sonoma	7	1,941 42	------	------	8	1,616 25	43	1,226 74	6	1,121 66	3	1,300 00
Stanislaus	8	2,141 37	------	------	11	1,387 04	43	1,105 15	7	1,119 04	9	1,047 25
Sutter	1	2,250 00	------	------	2	1,400 00	2	1,250 00	1	1,300 00	2	1,200 00
Tehama	3	1,999 91	------	------	4	1,512 50	13	1,161 55	3	1,150 00	3	1,233 34
Trinity	1	1,800 00	------	------	------	------	3	1,100 00	------	------	------	------
Tulare	9	2,188 89	------	------	18	1,343 89	43	1,240 12	10	1,410 00	13	1,303 85
Tuolumne	2	1,900 00	------	------	------	------	10	991 00	1	1,500 00	2	1,000 00
Ventura	5	2,290 00	------	------	10	1,530 00	19	1,362 10	5	910 00	9	1,015 93
Yolo	3	2,036 63	------	------	4	1,178 12	16	1,198 12	3	938 75	1	360 00
Yuba	2	1,922 50	------	------	3	1,490 00	6	1,116 66	2	1,560 00	3	1,250 00
Totals	285	†$2,306 63	11	†$2,019 66	886	†$1,450 64	1,996	†$1,336 95	701	†$1,249 74	932	†$1,196 01

Section 5.

GENERAL SCHOOL STATISTICS.

TABLE NO. 23. Showing Total Number of Teachers Employed in Kindergarten, Elementary and High Schools by Years, Total Number of Pupils Enrolled in Said Schools by Years and Total Average Daily Attendance by Years Since 1851; Total Amount of Money Apportioned by the State to the Schools, Raised by City and District Taxes and from Miscellaneous Sources; Total Amount of Money Paid for Teachers'.Salaries, Current Expenses, Libraries, Sites, Buildings, and Furniture; and Total Expenditures by Years Since 1852; Showing Cost for Teachers' and Trustees' Institutes by Counties; Number of Books in County Teachers' Libraries and Amount Paid for Such Books During the Year; Total Annual Expenses for County Superintendents' Offices, for County Boards of Education; Number of School Houses in State; Number of Certificates Issued by County Boards; Expenses of City Boards of Education; Expenditures of Superintendent of Public Instruction and State Board of Education.

TABLE No. 23.

GENERAL.

Statistical Summary, by years, of the Kindergarten, Night, Primary and Grammar and High Schools of California, from 1851 to 1918, Inclusive.

Years	Number of teachers	Number of children enrolled on school register	Average daily attendance
1851	------------	1,846	------------
1852	------------	3,314	------------
1853	------------	4,193	2,020
1854	214	9,746	4,635
1855	301	------------	6,442
1856	392	------------	8,495
1857	486	17,232	9,717
1858	517	19,822	11,183
1859	744	23,519	13,364
1860	831	26,993	14,750
1861	932	31,786	17,804
1862	962	36,566	19,262
1863	919	36,540	19,992
1864	1,079	47,588	24,794
1865	1,155	50,089	29,592
1866	1,268	50,273	33,989
1867	1,389	62,227	43,271
1868	1,590	65,828	43,681
1869	1,687	73,754	49,802
1870	1,869	85,808	54,271
1871	2,052	91,332	64,286
1872	2,301	94,720	65,700
1873	2,336	107,593	69,461
1874	2,452	120,240	72,283
1875	2,693	130,930	78,027
1876	2,894	140,468	83,891
1877	3,077	147,863	89,539
1878	3,393	154,064	94,696
1879	3,453	156,769	98,468
1880	3,595	158,765	100,966
1881	3,737	163,855	105,541
1882	3,777	168,024	107,177
1883	3,930	174,611	112,594
1884	4,083	179,801	124,814
1885	4,242	184,001	116,028
1886	4,444	189,220	125,718
1887	4,888	196,907	129,297
1888	4,938	207,050	132,277
1889	5,255	215,905	143,733
1890	5,434	221,756	146,589
1891	5,659	229,986	153,599
1892	5,891	238,106	158,875
1893	6,136	232,501	157,673
1894	6,257	235,837	164,664
1895	6,589	241,322	170,861
1896	6,885	249,335	176,083
1897	7,190	247,061	180,209
1898	7,432	259,459	185,424
1899	7,366	265,364	195,540
1900	7,605	269,736	197,395
1901	7,810	258,977	188,730
1902	8,072	264,038	197,217
1903	8,333	288,776	212,884
1904	8,652	299,038	222,182
1905	9,026	315,226	239,491
1906	9,371	328,127	248,722
1907	9,714	335,645	247,880
1908	10,222	347,193	262,522
1909	10,747	352,278	275,272
1910	11,369	368,391	286,730
1911	12,156	386,911	302,657
1912	13,248	414,078	323,657
1913	14,524	446,916	346,443
1914	15,618	501,021	374,493
1915	16,794	508,590	393,088
1916	17,860	540,688	410,978
1917	18,784	566,943	424,856
1918	19,732	602,750	429,637

TABLE No. 23—Continued.

GENERAL SUMMARIES: 1851-1914.

Statement, by Years, Showing the Amount of Receipts and Expenditures for Public, Primary, Grammar, High and Kindergarten Schools of the State of California, from 1851 to 1914, inclusive.

Years	Total amount of state school fund apportioned	Total amount raised by county and city taxes	Total amount raised from miscellaneous sources	Amount paid for salaries of teachers	Amount paid for repairs, fuel, and contingent expenses	Amount paid for libraries	Amount paid for apparatus	Amount paid for sites, buildings, and furniture	Total expenditures
1851				*	*	*	*	*	*
1852			$2,417 00	$21,355 42	$2,000 00	*	*	$4,748 32	$28,103 74
1853			10,626 00	30,215 00	10,525 00	*	*	13,491 01	54,231 01
1854	$52,061 00	$157,702 00	42,557 00	85,860 33	31,156 45	$3,990 52	*	151,822 52	272,829 82
1855	63,662 00	119,128 00	39,395 00	166,048 45	32,631 07	1,054 57	*	77,197 62	276,931 71
1856	69,961 00	121,639 00	28,619 00	200,941 00	49,668 84	2,127 16	*	52,484 00	305,221 00
1857	78,057 00	148,989 00	55,035 00	192,613 00	52,533 44	2,942 56	*	59,743 00	307,832 00
1858	53,405 00	162,870 00	85,107 00	203,276 37	45,395 92	3,042 78	*	88,199 70	339,914 77
1859	72,319 00	205,196 00	97,534 00	264,972 37	69,396 38	2,368 58	*	90,266 42	427,003 75
1860	81,118 00	230,514 00	122,858 00	311,165 38	50,989 41	1,756 09	*	110,352 86	474,263 74
1861	81,461 00	241,861 00	114,397 00	311,501 91	54,493 99	2,299 28	*	101,818 38	470,113 56
1862	75,412 00	294,828 00	141,806 00	330,249 02	59,479 76	2,225 57	*	49,274 62	441,228 97
1863	145,537 00	328,554 00	68,209 00	328,338 02	58,271 97	594 75	$2,271 22	93,931 53	483,407 49
1864	132,217 00	260,842 00	84,084 00	411,101 01	69,562 36	1,132 21	6,010 84	167,393 44	655,199 86
1865	168,828 00	390,306 00	91,181 00	526,585 14	89,056 57	5,792 01	3,777 86	257,804 98	883,016 56
1866	132,410 00	470,668 00	79,600 00	551,462 02	116,577 47	2,074 81	4,059 47	185,056 42	859,230 19
1867	268,910 00	595,718 00	81,066 00	696,110 28	206,412 25	10,125 01	5,431 83	238,070 64	1,156,150 01
1868	252,603 00	654,738 00	73,986 00	763,639 15	143,518 56	19,069 56	4,061 72	221,118 43	1,151,407 42
1869	290,796 00	847,229 00	66,531 00	873,814 07	185,672 91	20,415 76	4,915 83	205,766 95	1,290,585 52
1870	360,447 00	839,756 00	63,441 00	976,937 75	179,070 23	29,984 22	3,692 27	339,362 37	1,529,046 84
1871	423,853 00	923,809 00	46,660 00	1,103,125 14	289,691 57	26,766 30	3,689 46	390,158 50	1,713,430 97
1872	424,022 00	1,249,943 00	232,075 00	1,282,799 15	277,900 99	25,793 54	4,720 13	290,119 01	1,881,332 82
1873	430,220 00	1,541,597 00	310,502 00	1,434,366 93	275,674 70	24,879 48	4,365 70	374,069 44	2,113,356 25
1874	428,414 12	1,332,208 82	345,316 95	1,560,830 16	331,952 30	21,752 82	4,152 80	192,467 25	2,111,155 33
1875	1,212,252 03	1,115,530 06	676,259 64	1,810,479 62	381,806 62	33,962 72	10,713 02	421,279 36	2,658,241 34
1876	1,317,603 84	1,240,637 31	158,206 40	1,983,939 96	374,222 49	48,757 50	10,974 66	440,706 37	2,858,600 98
1877	1,474,600 26	1,486,233 73	137,100 31	2,149,435 70	378,754 50	55,148 64	18,964 19	147,426 43	2,749,729 46
1878	1,579,195 52	1,393,014 96	106,396 84	2,272,551 19	426,707 66	53,947 85	12,513 65	390,094 92	3,155,815 27
1879	1,423,941 75	1,446,852 04	92,852 41	2,285,732 39	371,992 13	46,490 50	13,565 73	293,126 38	3,010,907 13
1880	1,506,171 84	1,393,572 44	104,824 80	2,207,043 85	400,867 61	44,546 39	21,842 63	190,270 94	2,864,571 42
1881	1,790,457 62	1,343,306 02	32,048 79	2,346,056 58	401,572 56	79,432 10	15,694 04	204,849 66	3,047,604 94
1882	1,882,121 67	1,260,843 64	23,046 88	2,406,780 68	411,117 17	63,060 32	20,618 98	221,089 05	3,122,666 20

1883	1,890,724 20	1,315,818 96	32,462 71	2,511,078 40	419,760 85	61,032 26	26,504 11	293,839 66	3,312,215 28
1884	1,894,191 00	1,411,543 56	27,715 40	2,573,623 54	415,587 39	59,642 08	23,204 69	292,165 85	3,364,223 55
1885	1,831,171 44	1,694,959 45	53,140 83	2,583,403 46	433,972 56	64,056 08	16,787 03	466,811 74	3,565,030 87
1886	1,890,733 32	1,690,704 86	138,596 48	2,710,621 82	422,843 30	64,627 32	24,833 01	283,006 18	3,505,931 63
1887	2,027,789 40	1,793,809 95	51,250 25	2,912,859 30	480,455 63	64,189 18	23,679 10	408,704 96	3,889,888 17
1888	2,168,686 08	2,170,058 19	259,554 55	3,083,027 24	527,035 55	58,229 04	31,534 85	621,554 82	4,321,381 50
1889	2,531,880 00	2,442,254 64	337,006 91	3,343,191 80	624,810 95	59,522 72	33,791 82	935,548 42	4,996,865 71
1890	2,635,716 10	2,293,335 75	98,092 22	3,594,588 98	706,995 12	71,121 94	42,442 85	703,947 79	5,119,096 68
1891	2,662,200 08	2,249,975 72	134,192 19	3,713,544 37	732,148 98	72,714 87	45,352 20	548,740 11	5,112,500 53
1892	2,354,786 00	2,464,706 04	266,455 77	3,874,346 88	750,929 32	72,961 08	45,424 77	608,229 27	5,351,891 32
1893	3,403,072 72	2,404,898 76	774,090 08	4,055,888 51	806,717 80	76,677 51	46,837 62	723,565 66	5,709,687 10
1894	2,770,661 84	2,388,359 31	337,815 12	4,005,721 80	752,757 68	61,890 04	30,130 55	574,293 10	5,424,793 17
1895	2,829,005 74	2,472,540 41	508,203 22	4,081,340 44	793,834 91	63,601 20	46,915 95	698,215 59	5,683,908 09
1896	3,043,884 60	2,517,827 78	256,021 31	4,291,481 12	899,861 54	71,249 23	35,492 78	503,674 80	5,801,759 47
1897	2,943,310 10	2,677,945 07	156,638 37	4,418,544 67	899,726 74	68,719 53	18,885 63	441,871 03	5,847,747 60
1898	3,106,072 72	2,684,416 96	364,030 62	4,582,625 71	1,010,710 13	72,975 97	16,693 40	494,899 39	6,177,904 60
1899	3,076,472 40	2,690,705 16	172,053 24	4,562,994 54	1,025,473 62	‡88,341 06	----------	397,793 15	6,074,602 37
1900	3,567,763 56	2,861,409 16	296,345 64	4,850,804 22	994,727 41	‡81,749 79	----------	268,157 32	6,195,438 74
1901	3,485,126 45	2,888,046 10	93,171 60	4,685,144 20	1,080,040 37	‡82,995 12	----------	525,050 16	6,373,229 85
1902	3,584,001 45	3,076,699 73	99,687 86	4,748,472 75	1,329,359 68	‡88,923 05	----------	439,305 94	6,606,061 42
1903	3,590,390 40	3,887,778 68	699,758 22	5,665,431 02	1,461,838 79	‡105,016 92	----------	937,879 47	8,170,166 20
1904	3,926,972 18	4,644,967 95	1,299,565 92	6,027,850 53	1,500,815 22	‡138,439 04	----------	1,734,359 36	9,401,464 15
1905	4,234,241 02	4,580,258 78	1,961,805 35	6,460,879 67	1,675,564 94	‡133,457 82	----------	1,408,100 86	9,678,003 29
1906	3,880,740 82	3,681,439 68	1,603,236 84	7,003,176 86	1,805,867 52	‡148,351 94	----------	1,983,163 70	10,940,560 02
1907	‡4,300,379 23	7,394,551 55	593,194 87	7,422,575 41	2,011,921 54	163,996 70	----------	2,620,211 24	12,218,704 89
1908	4,497,337 81	8,899,459 82	630,502 51	8,720,931 65	2,307,417 49	164,413 82	----------	3,229,940 91	14,423,703 87
1909	4,761,954 30	11,993,868 62	436,490 96	9,325,688 76	2,472,519 54	186,428 37	----------	4,000,619 07	15,985,255 74
1910	5,101,950 89	13,308,417 90	415,887 54	10,233,858 10	2,926,957 70	233,163 59	----------	4,536,538 36	17,930,517 75
1911	5,682,117 16	13,833,191 32	623,852 21	11,381,661 72	3,777,912 90	252,923 02	----------	4,958,430 18	20,370,927 82
1912	6,110,857 30	19,423,138 34	507,038 56	12,687,314 29	3,831,017 88	243,136 22	----------	7,217,152 22	23,978,620 61
1913	5,773,467 02	27,749,637 40	526,294 63	14,603,061 71	4,833,792 73	289,151 89	----------	5,828,913 03	25,554,419 36
1914	6,073,096 14	20,560,162 99	464,868 39	16,314,791 25	4,622,736 78	310,089 72	----------	5,332,285 92	26,579,903 62
1915	6,170,971 30	25,523,371 66	6,203,654 10	17,067,504 16	5,919,066 53	299,152 61	----------	8,406,237 98	31,691,961 28
1916	6,546,304 12	24,620,452 48	1,465,325 71	17,715,673 87	3,777,488 49	479,584 70	----------	8,153,908 63	30,126,651 69
1917	6,661,129 17	23,890,715 09	1,023,012 58	20,597,198 81	6,369,347 13	539,044 20	----------	5,745,141 14	33,250,731 28
1918	6,861,732 00	22,466,410 96	1,737,981 12	20,818,966 12	6,232,370 34	541,209 12	----------	5,258,820 46	32,881,366 04

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*Not reported.

†Includes cost of apparatus. ‡Does not include balance on hand.

TABLE No. 23—Continued.

Miscellaneous School Statistics, Showing Cost of Teachers' and Trustees' Institutes for School Years Closing June 30, 1917 and 1918.

Counties	Cost of teachers' institutes for 1916-17		Cost of teachers' institutes for 1917-18		Cost of trustees' institutes for 1916-17		Cost of trustees' institutes for 1917-18	
	For lecturers	For other expenses	For lecturers	For other expenses	For lecturers	For other expenses	For lecturers	For other expenses
Alameda	$200 00		$125 00	$33 05	$20 00	$10 00		
Alpine								
Amador	293 69	$56 40	232 50	136 92				
Butte		38 00	50 00	150 00		30 00		$5 50
Calaveras	127 95	35 50	250 00	32 20				
Colusa	34 25	46 40	150 00					
Contra Costa	200 00		464 68	98 26			$53 30	54 00
Del Norte			203 25	10 50				
El Dorado	124 30	142 10	153 00	136 58				
Fresno	935 40	271 35	769 60	826 60	25 00	104 00		150 18
Glenn	25 00	4 25		150 90			25 00	55 30
Humboldt	425 00	114 50	575 00	77 80				
Imperial	391 50	97 55	335 00	39 70	60 00		50 00	35 00
Inyo	274 46	18 50	275 00	22 75				
Kern	285 00	297 47	112 50	197 56		250 55	25 00	184 92
Kings	250 90	29 70	255 00	17 00				
Lake	265 00	22 10	249 00	41 00				
Lassen	213 60	5 60	254 00		37 20		50 00	
Los Angeles	1,585 00	71 00	1,310 00	66 27	255 00	313 55	40 00	238 78
Madera	267 56	42 00	303 60	12 04				
Marin	200 00	15 69	200 00	16 50				70 80
Mariposa	273 80	13 75	239 80	22 00				
Mendocino	230 00	69 00	295 20	51 36				
Merced	352 00	75 00	381 70	87 30				
Modoc	216 50	59 15	205 30	55 20	51 40	171 90		
Mono								
Monterey	301 65	68 75	237 05	78 25			96 00	
Napa	225 00	89 00	264 00	50 00				
Nevada	209 50	57 36	228 64	40 00				
Orange	380 00	28 57	515 00	41 30			65 00	51 60
Placer	188 00	67 82	137 78	74 50	55 00	57 28	25 00	47 10
Plumas	240 00	51 90	240 00	58 25		1 25	40 00	10 00
Riverside	340 00	45 00	300 05	48 95	85 00	136 65		73 15

Sacramento	222 30	24 90	180 00	112 80				
San Benito	265 00	34 25	267 25	23 70				22 10
San Bernardino	202 75	124 12	200 00	154 65			50 00	199 24
San Diego	242 50	17 50	225 00	34 50	35 00	235 75	105 38	316 54
San Francisco	870 00	646 00	900 00	911 00				
San Joaquin	281 50	70 65	339 57	60 43			45 00	13 75
San Luis Obispo	242 10	57 25	291 03	73 07			50 00	6 50
San Mateo	225 00	42 25	175 00	77 20	65 00	6 75		
Santa Barbara	219 76	28 25	340 00	2 00				
Santa Clara	252 00	21 75	285 00	43 50	45 00			
Santa Cruz	249 60	74 83	321 40	32 00	20 00	18 25		
Shasta	263 40		143 70		37 00		14 75	
Sierra			80 00	41 00				
Siskiyou	300 00	50 00	265 00	68 25				
Solano	150 00	59 25	175 00			17 75	25 00	26 00
Sonoma	290 00	47 29	302 70	37 90				
Stanislaus	388 05	66 00	200 00		19 95		50 50	
Sutter	25 00	68 05	150 00	46 55			42 50	13 10
Tehama		25 00	72 20	150 00	14 00	169 20	25 00	197 00
Trinity	235 00	15 00	247 50	50 50				
Tulare	350 00	208 19	417 90	251 15		225 90		
Tuolumne	287 25	16 85	285 00	9 60				
Ventura	635 85	105 81	625 00	184 70			100 00	12 50
Yolo	228 60	58 70	168 00					
Yuba	176 00		30 00	150 00			35 50	14 30
Totals	$15,691 61	$3,785 61	$15,997 72	$5,187 23	$824 55	$1,694 38	$1.012 93	$1,797 76

TABLE No. 23—Continued.

Miscellaneous School Statistics, Showing Number of Books in County Teachers' Libraries and Amount of Money Paid for Books for Years Closing June 30, 1917 and 1918.

Counties	Number of books in teachers' libraries		Amount of money paid for books	
	1916-17	1917-18	1916-17	1917-18
Alameda	2,424	2,436	$122 10	$130 00
Alpine	70	70	40 83	----------
Amador	1,225	1,286	72 95	35 00
Butte	260	400	60 26	84 44
Calaveras	448	452	11 70	10 33
Colusa	454	474	4 20	121 28
Contra Costa	1,800	1,800	17 50	5 80
Del Norte	500	550	7 35	25 00
El Dorado	444	452	18 75	33 05
Fresno	3,868	3,875	----------	219 18
Glenn	932	960	40 88	30 63
Humboldt	878	885	67 62	46 33
Imperial	350	350	58 14	----------
Inyo	125	150	----------	----------
Kern	735	780	84 36	39 94
Kings	141	143	75 00	----------
Lake	384	387	19 70	25 66
Lassen	448	448	19 82	2 30
Los Angeles	8,662	8,937	1,825 00	----------
Madera	1,200	1,200	29 85	6 00
Marin	482	525	30 73	43 85
Mariposa	700	750	42 80	6 00
Mendocino	800	850	107 00	92 50
Merced	463	475	7 10	139 62
Modoc	600	624	42 75	22 57
Mono	227	227	----------	----------
Monterey	2,875	295	54 00	76 00
Napa	1,250	1,300	53 00	50 50
Nevada	353	355	24 05	13 00
Orange	5,095	6,010	258 95	42 55
Placer	876	899	45 37	30 25
Plumas	100	100	9 00	13 00
Riverside	750	750	135 00	133 00
Sacramento	1,200	1,200	175 00	63 00
San Benito	486	486	194 65	----------
San Bernardino	2,736	3,697	114 00	179 00
San Diego	1,998	2,168	139 00	184 00
San Francisco	2,720	2,798	181 17	263 23
San Joaquin	1,115	1,145	40 59	91 87
San Luis Obispo	772	780	76 97	26 03
San Mateo	2,860	2,896	54 12	24 57
Santa Barbara	200	261	61 00	93 00
Santa Clara	3,002	3,045	59 56	84 18
Santa Cruz	2,050	2,150	11 29	16 61
Shasta	930	968	83 77	74 85
Sierra	232	232	----------	----------
Siskiyou	1,040	1,040	----------	200 00
Solano	520	525	49 60	30 09
Sonoma	2,162	2,170	17 10	18 00
Stanislaus	1,017	945	91 13	1 49
Sutter	2,395	338	7 49	61 12
Tehama	600	600	1 50	----------
Trinity	400	410	19 85	22 00
Tulare	4,600	4,800	----------	279 00
Tuolumne	52	55	----------	----------
Ventura	1,700	1,800	50 00	----------
Yolo	2,500	2,700	38 00	50 00
Yuba	404	404	75 11	1 25
Totals	77,610	76,808	$4,926 66	$3,241 07

TABLE No. 23—Continued.

Miscellaneous School Statistics, Showing County Expenses for Schools, Salary of County Superintendent and Deputies and Office Expenses for Year Closing June 30, 1917.

Counties	Annual salary of superintendent and deputies	Traveling expenses	Postage and expressage	Other expenses	Total for year
Alameda	$11,200 00	$567 80	$315 00	------------	$12,082 80
Alpine	200 00	------------	5 00	7 50	212 50
Amador	1,500 00	212 00	92 00	20 00	1,824 00
Butte	2,720 00	366 89	141 25	681 30	3,909 44
Calaveras	1,500 00	107 05	91 00	28 20	1,726 25
Colusa	2,400 00	246 93	------------	213 85	2,860 78
Contra Costa	4,450 00	94 20	121 00	------------	4,665 20
Del Norte	720 00	28 50	30 00	------------	778 50
El Dorado	1,800 00	264 30	118 00	29 90	2,212 20
Fresno	7,800 00	1,537 79	270 00	------------	9,607 79
Glenn	2,700 00	430 00	94 00	20 00	3,244 00
Humboldt	3,400 00	426 75	141 50	241 25	4,209 50
Imperial	3,600 00	372 46	------------	697 41	4,669 87
Inyo	1,500 00	155 00	55 00	65 00	1,775 00
Kern	7,200 00	61 85	228 08	383 01	7,872 94
Kings	2,400 00	112 00	90 00	154 20	2,756 20
Lake	1,000 00	108 10	47 50	63 35	1,218 95
Lassen	1,500 00	388 00	90 00	------------	1,978 00
Los Angeles	23,830 00	325 26	875 00	------------	25,030 26
Madera	2,300 00	210 35	90 64	------------	2,600 99
Marin	3,600 00	343 70	99 00	------------	4,042 90
Mariposa	600 00	268 90	66 00	88 10	1,023 00
Mendocino	2,400 00	796 40	150 00	210 00	3,556 40
Merced	3,200 00	334 45	128 00	------------	3,662 45
Modoc	1,500 00	161 55	30 10	8 50	1,700 15
Mono	400 00	160 00	23 25	40 89	624 14
Monterey	3,480 00	864 60	203 00	1,260 71	5,808 31
Napa	2,500 00	344 50	116 00	626 62	3,587 12
Nevada	2,000 00	117 45	89 00	12 50	2,218 95
Orange	3,150 00	163 80	100 00	193 04	3,606 84
Placer	2,400 00	200 00	125 00	------------	2,725 00
Plumas	800 00	320 00	66 00	20 00	1,206 00
Riverside	3,600 00	694 80	120 00	580 15	4,994 95
Sacramento	5,100 00	13 60	206 00	497 10	5,816 70
San Benito	1,800 00	332 50	75 00	------------	2,207 50
San Bernardino	3,600 00	447 00	180 00	800 00	5,027 00
San Diego	7,149 92	606 51	323 00	1,168 41	9,247 84
San Francisco	23,320 00	800 00	------------	------------	24,120 00
San Joaquin	4,500 00	------------	190 00	27 50	4,717 50
San Luis Obispo	2,400 00	628 05	75 00	122 50	3,225 55
San Mateo	2,100 00	282 80	83 00	------------	2,465 80
Santa Barbara	3,080 00	402 00	143 00	320 31	3,945 31
Santa Clara	4,726 25	320 40	151 45	600 45	5,798 55
Santa Cruz	2,400 00	376 85	122 00	------------	2,898 85
Shasta	2,400 00	639 30	222 00	------------	3,261 30
Sierra	625 00	65 90	36 00	38 00	764 90
Siskiyou	2,000 00	348 05	190 00	304 29	2,842 34
Solano	3,300 00	205 10	50 00	287 90	3,843 00
Sonoma	3,500 00	182 50	190 00	------------	3,872 50
Stanislaus	3,020 00	500 00	120 00	42 40	3,682 40
Sutter	1,600 00	88 35	65 00	50 65	1,804 00
Tehama	2,400 00	650 00	136 00	1,000 00	4,186 00
Trinity	1,000 00	176 82	50 00	84 35	1,311 17
Tulare	4,400 00	740 42	324 00	407 80	5,872 22
Tuolumne	1,000 00	------------	70 00	25 00	1,095 00
Ventura	2,880 00	419 60	146 00	410 25	3,855 85
Yolo	1,800 00	217 40	50 00	312 35	2,379 75
Yuba	1,800 00	173 45	31 38	186 30	2,191 13
Totals	$202,851 17	$19,201 98	$7,314 15	$12,331 04	$241,698 34

TABLE No. 23—Continued.

Miscellaneous School Statistics, Showing County Expenses for Schools, Salary of County Superintendent and Deputies and Office Expenses for School Year Ending June 30, 1918.

Counties	Annual salary of superintendent and deputies	Traveling expenses	Postage and expressage	Other expenses	Total for year
Alameda	$11,200 00	$567 80	$315 00		$12,082 80
Alpine	200 00		6 00	$7 50	213 50
Amador	1,500 00	299 70	92 00	209 21	2,100 91
Butte	2,720 00	356 96	160 22	1,029 84	4,267 02
Calaveras	1,500 00	147 50	102 00	40 00	1,789 50
Colusa	2,400 00	281 56	95 00	340 22	3,116 78
Contra Costa	6,450 00	798 05			7,248 05
Del Norte	720 00	21 00	30 00		771 00
El Dorado	1,800 00	295 50	117 00		2,212 50
Fresno	12,300 00	1,865 40	65 84	1,085 28	15,316 52
Glenn	2,700 00	544 60	95 00	202 75	3,542 35
Humboldt	3,400 00	428 42	117 82	173 27	4,119 51
Imperial	3,600 00	525 67	100 00	530 20	4,755 87
Inyo	1,500 00	151 25	59 00	87 83	1,798 08
Kern	7,200 00	76 05	317 11	625 46	8,218 62
Kings	2,700 00	180 00	90 00	98 04	3,068 04
Lake	1,000 00	69 20	50 00	106 55	1,225 75
Lassen	1,500 00	297 00	92 00		1,889 00
Los Angeles	25,380 00	536 34	1,047 96	2,374 87	29,339 17
Madera	2,300 00	280 90	97 03	485 81	3,163 74
Marin	3,600 00	384 80	100 00	487 46	4,572 26
Mariposa	600 00	340 55	74 00	90 28	1,104 83
Mendocino	2,400 00	642 86	246 40	182 97	3,472 23
Merced	3,200 00	330 70	148 75	413 20	4,092 65
Modoc	1,500 00	287 45	50 47	12 35	1,850 27
Mono	400 00				400 00
Monterey	3,834 66	666 65	199 00	1,081 90	5,782 21
Napa	2,500 00	374 59	116 00	667 45	3,658 04
Nevada	2,000 00	125 80	51 00	67 05	2,243 85
Orange	3,150 00	216 28	65 00	336 95	3,768 23
Placer	2,400 00	250 00	11 28	28 49	2,689 77
Plumas	800 00	320 00	66 00	40 00	1,226 00
Riverside	3,600 00	776 80	120 00	399 66	4,896 46
Sacramento	5,100 00	302 53		353 84	5,756 37
San Benito	1,800 00	378 00	76 00		2,254 00
San Bernardino	3,600 00	432 40	207 00	357 25	4,596 65
San Diego	5,450 00	613 08	268 25	525 01	6,856 34
San Francisco	24,160 00	1,200 00	514 31	772 70	26,647 01
San Joaquin	3,500 00	500 00	225 00	120 00	4,345 55
San Luis Obispo	2,700 00	764 05	170 00	406 92	4,040 97
San Mateo	2,216 50	357 35	88 35	383 22	3,045 42
Santa Barbara	3,080 00	347 24	147 00	170 06	3,744 30
Santa Clara	5,121 25	295 53	165 85	665 77	6,248 40
Santa Cruz	2,400 00	436 25	5 10	250 04	3,091 39
Shasta	2,400 00	691 16	228 00		3,319 16
Sierra	625 00	94 25	36 00	40 00	795 25
Siskiyou	2,000 00	726 40	200 00	206 17	3,132 57
Solano	3,420 00	197 56	110 09	351 19	4,078 84
Sonoma	3,500 00	143 05	200 00	400 00	4,243 05
Stanislaus	3,020 00	500 00	128 00	1,368 08	5,016 08
Sutter	1,600 00	70 50	65 48	142 50	1,878 48
Tehama	2,400 00	632 00	152 00	782 59	3,966 59
Trinity	1,000 00	116 00	54 00	40 95	1,210 95
Tulare	4,566 62	792 50	30 00	657 83	6,046 95
Tuolumne	1,000 00	17 50	70 00		1,087 50
Ventura	3,100 00	400 00	146 00	1,230 51	4,876 51
Yolo	1,800 00	199 41	90 00	180 65	2,270 06
Yuba	1,800 00	251 80	53 31	306 95	2,412 06
Totals	$213,414 03	$22,897 94	$7,726 62	$20,916 82	$264,955 11

TABLE No. 23—Continued.

Miscellaneous School Statistics, Showing County Expenses for Schools, Cost of County Board of Education for the School Year Ending June 30, 1917.

Counties	Total per diem paid members	Traveling expenses	Other expenses	Total for year
Alameda	$1,180 00			$1,180 00
Alpine	70 00	$16 00		86 00
Amador	715 00	12 00		727 00
Butte	1,420 00	199 10	$127 28	1,746 38
Calaveras	915 00	30 20	261 49	1,206 69
Colusa	940 00	73 80		1,013 80
Contra Costa	1,160 00	219 50		1,379 50
Del Norte	335 00		7 45	342 45
El Dorado	1,230 00	63 40		1,293 40
Fresno	1,850 00	149 66		1,999 66
Glenn	1,450 00	44 80		1,494 80
Humboldt	290 00	78 40	14 22	382 62
Imperial	340 62	42 45	279 23	662 30
Inyo	175 00	64 80	50 00	289 80
Kern	2,140 00	10 15	547 30	2,697 45
Kings	1,270 00		100 00	1,370 00
Lake	380 00	36 10	25 00	441 10
Lassen	700 00	126 25		826 25
Los Angeles	1,600 00	77 60		1,677 60
Madera	795 00	36 00		831 00
Marin	425 00	140 80		565 80
Mariposa	525 00	31 70	201 00	757 70
Mendocino	640 00	267 00	220 00	1,127 00
Merced	1,070 00	213 60	35 70	1,319 30
Modoc	850 00	238 00		1,088 00
Mono	295 00	28 20		323 20
Monterey	1,135 00	547 20	294 85	1,977 05
Napa	1,250 00			1,250 00
Nevada	670 00	51 20		721 20
Orange	900 00	124 80		1,024 80
Placer	485 00	189 20		674 20
Plumas	585 00	247 20	25 00	857 20
Riverside	715 00	330 15	319 03	1,364 18
Sacramento	1,170 00	66 00		1,236 00
San Benito	750 00	67 40		817 40
San Bernardino	500 00	53 75		553 75
San Diego	625 00	147 00		772 00
San Francisco				
San Joaquin	1,220 00	332 40	100 00	1,652 40
San Luis Obispo	1,135 00	13 50	263 07	1,411 57
San Mateo	950 00	219 50		1,169 50
Santa Barbara	695 00	217 80	107 00	1,019 80
Santa Clara	2,235 00	31 90	78 89	2,345 79
Santa Cruz	940 00	168 00		1,108 00
Shasta	945 00	56 90		1,001 90
Sierra	225 00	92 00	30 50	347 50
Siskiyou	1,365 00	216 40	465 85	2,047 25
Solano	755 00	94 60	53 95	903 55
Sonoma	935 00	239 70	95 00	1,269 70
Stanislaus	575 00	101 70		676 70
Sutter	1,040 00	133 80		1,173 80
Tehama	735 00	164 30	500 00	1,399 30
Trinity	512 00	110 20	246 75	868 95
Tulare	710 00	152 80	141 34	1,004 14
Tuolumne	580 00	43 30	344 80	968 10
Ventura	750 00	95 00	202 40	1,047 40
Yolo	725 00	97 40	30 75	853 15
Yuba	550 00	266 25	1,340 25	2,156 50
Totals	$50,122 62	$6,870 86	$5,508 10	$62,501 58

TABLE No. 23—Continued.

Miscellaneous School Statistics, Showing County Expenses for Schools, Cost of County Board of Education for the School Year Ending June 30, 1918.

Counties	Total per diem paid members	Traveling expenses	Other expenses	Total expenses for year
Alameda	$630 00			$630 00
Alpine	60 00	$11 20		71 20
Amador	570 00	13 60	$86 00	669 60
Butte	1,225 00	127 50	213 25	1,565 75
Calaveras	630 00	32 20	57 20	719 40
Colusa	840 00	83 20		923 20
Contra Costa	1,175 00	229 40		1,404 40
Del Norte	370 00		38 00	408 00
El Dorado	1,015 00	36 80		1,051 80
Fresno	1,885 00	242 57	188 75	2,316 32
Glenn	1,737 00	105 60	494 55	2,337 15
Humboldt	630 00	89 60	5 45	725 05
Imperial	90 00	4 00		94 00
Inyo	145 00	64 20		209 20
Kern	1,415 00	7 11	688 68	2,110 79
Kings	1,170 00		123 85	1,293 85
Lake	415 00	36 30	95 00	546 30
Lassen	537 50	81 50		619 00
Los Angeles	1,600 00		366 29	1,966 29
Madera	717 50	36 00	261 00	1,014 50
Marin	495 00	151 20	30 00	676 20
Mariposa	500 00	65 50	57 95	623 45
Mendocino	612 50	290 80	128 75	1,032 05
Merced	670 00	360 00	144 45	1,174 45
Modoc	615 00	169 00		784 00
Mono				
Monterey	1,000 00	498 80	471 28	1,970 08
Napa	1,300 00			1,300 00
Nevada	590 00	149 77		739 77
Orange	1,075 00	128 00	313 80	1,516 80
Placer	435 00	432 80	619 43	1,487 23
Plumas	675 00	188 00	25 00	888 00
Riverside	590 00	310 05	134 55	1,034 60
Sacramento	1,980 00	93 31	93 44	2,166 75
San Benito	750 00	60 00		810 00
San Bernardino	275 00	28 29	20 75	324 04
San Diego	590 00	115 50	460 00	1,165 50
San Francisco	39,139 50	275 41	7,388 19	46,803 10
San Joaquin	1,600 00	377 40	75 00	2,052 40
San Luis Obispo	890 00	20 00	196 65	1,106 65
San Mateo	975 00	264 50		1,239 50
Santa Barbara	752 50	279 60	149 75	1,181 85
Santa Clara	1,935 00	50 00	390 60	2,375 60
Santa Cruz	350 00	34 00	227 00	611 00
Shasta	955 00	61 50		1,016 50
Sierra	200 00	99 20	35 00	334 20
Siskiyou	1,080 00	601 80	329 55	2,011 35
Solano	720 00	119 40	165 09	1,004 49
Sonoma	790 00	144 00	343 60	1,277 60
Stanislaus	460 00	91 80	258 23	810 03
Sutter	925 00	132 00	324 51	1,381 51
Tehama	415 00	166 00	37 05	618 05
Trinity	392 00	44 60	25 88	462 48
Tulare	805 00	289 98	299 75	1,394 73
Tuolumne	625 00	47 60	112 55	785 15
Ventura	765 00	133 80	200 00	1,098 80
Yolo	852 50	96 00	49 40	997 90
Yuba	1,400 00	394 40	44 50	1,838 90
Totals	$85,036 00	$7,964 79	$15,769 72	$108,770 51

NOTE.—The great increase of cost of county boards this year over last is caused by City and County Board of San Francisco being reported as a county board in place of city board, as in the past.

TABLE No. 23—Continued.

Miscellaneous School Statistics, Showing Number of School Houses in State and Material of Which Constructed, for Year Closing June 30, 1917.

Counties	Kindergarten school buildings built of			Elementary school buildings built of				High school buildings built of				Total, all kinds
	Concrete	Brick	Wood	Stone or class A	Concrete	Brick	Wood	Stone or class A	Concrete	Brick	Wood	
Alameda			2	5	17	17	99		4	4	10	158
Alpine							3					3
Amador				1		4	39		2		1	47
Butte					8	7	74		1	1	1	92
Calaveras					1	1	50				1	53
Colusa					2	2	35		2	1	2	44
Contra Costa						5	59	1		2	4	71
Del Norte							16				1	17
El Dorado							57				1	58
Fresno					3	29	141		2	5	7	187
Glenn					5		37		1	1	2	46
Humboldt						1	24		1		3	128
Imperial					1	3	56		2	3		65
Inyo					4		20				1	25
Kern	1			2	4	16	107			8	1	139
Kings					5	4	33			2	1	45
Lake						1	37		1			39
Lassen				1		1	43		1			46
Los Angeles		2	13		30	135	805		45	84	34	1,148
Madera						2	45			1	1	49
Marin						1	52				3	56
Mariposa							31		1			32
Mendocino							129				8	137
Merced					1	4	71			5		81
Modoc					1	3	37		1	1	1	44
Mono							11					11
Monterey						1	100		3	1	1	106
Napa					2	2	47	1			2	54
Nevada							53			1		54
Orange			5		4	7	41		1	4	1	63
Placer						3	51			3		57
Plumas					3	1	28		1			33
Riverside	1		4		5	13	63		6	2	1	95
Sacramento		4	7	1	7	6	83			3	2	113
San Benito							38			1		39
San Bernardino			2	1	11	21	83	15		7	1	141
San Diego			3		26	7	112	1	6	1	2	158
San Francisco				6	23	11	47	2		3		92
San Joaquin				2	1	18	84	2		8		115
San Luis Obispo					2	2	91	1		2	3	101
San Mateo			2			1	52		2	1		58
Santa Barbara			6		2		74	1	1		2	86
Santa Clara			1	1	1		113			1	9	126
Santa Cruz					1	1	64		1		2	69
Shasta						8	108			1	2	119
Sierra							18				1	19
Siskiyou					4	5	85			1	2	97
Solano			2		2	1	59		2	1	3	70
Sonoma						5	158	2	1		6	172
Stanislaus					4	8	80		7	6	1	106
Sutter					2	1	32		1			36
Tehama					3	2	61		3			69
Trinity							28				1	29
Tulare					1	33	117	1		6	1	159
Tuolumne					1	2	29		1		1	34
Ventura			2			1	55	2		1	2	63
Yolo					3	1	42		2		1	49
Yuba						1	38	1			1	41
Totals	2	6	49	20	190	397	4,345	31	101	172	131	5,444

TABLE No. 23—Continued.

Miscellaneous School Statistics, Showing Number of School Houses in State and Material of Which Constructed, for Year Closing June 30, 1918.

Counties	Kindergarten school buildings built of			Elementary school buildings built of					High school buildings built of					Total, all kinds
	Concrete	Brick	Wood	Steel	Stone	Concrete	Brick	Wood	Steel	Stone	Concrete	Brick	Wood	
Alameda			3	5	2	16	18	99			4	4	10	161
Alpine								3						3
Amador				1			4	38			2		1	46
Butte						8	7	73			2	1	2	93
Calaveras						1	1	50					1	53
Colusa						3	1	32			2	1	2	41
Contra Costa							5	59		1		2	4	71
Del Norte								16					1	17
El Dorado	1					1		56					1	59
Fresno			1			3	34	144			1	10	16	209
Glenn						5		37			1	1		44
Humboldt								124			1		3	128
Imperial						1	3	56				2	2	65
Inyo						3		23					1	27
Kern	1			2		4	16	110				8	1	142
Kings						5	4	33				2	1	45
Lake						1		37			1		1	40
Lassen					1		1	43			1			46
Los Angeles		2	13			30	139	820			45	84	34	1,167
Madera							2	46				1	1	50
Marin							1	52					3	56
Mariposa								35			1			36
Mendocino								132					8	140
Merced			1			6	4	64				5	1	81
Modoc					1	2	3	37		1		1	1	46
Mono								11						11
Monterey							1	98			3	1	1	104
Napa					1	3		47	1			2		54
Nevada								50			1	1		52
Orange			6			4	7	41			1	4	1	64
Placer						2	2	52				3		59
Plumas						3	1	28			1			33
Riverside	1		5			6	13	64			7	2	1	99
Sacramento		4	7	1		7	6	83				3	2	113
San Benito						27	7	38					1	39
San Bernardino			4		1	13	21	83	15			7	1	145
San Diego		1	3			27	7	112		1	7	1	2	161
San Francisco				6	14	20		46	2	2		1	1	92
San Joaquin					3	1	19	85			2	8		118
San Luis Obispo			1			2	2	92		1		2	3	103
San Mateo			2				1	55			2	1	3	64
Santa Barbara			6			2	1	75		1	1		2	88
Santa Clara			1		1	1		113				1	9	126
Santa Cruz						1	1	64			2		1	69
Shasta							8	108			1	1	2	120
Sierra								18					1	19
Siskiyou						4	5	88	1			1	1	100
Solano			2			2	1	59			2	1	3	70
Sonoma						1	5	157	3	1			5	172
Stanislaus				1		4	8	79	3		5	1	6	107
Sutter						2	1	32			1			36
Tehama						3	2	61			3			69
Trinity								30					1	31
Tulare						1	37	115		1		8	2	164
Tuolumne						1	2	29			1		1	34
Ventura			2			1	1	58			1	1	4	68
Yolo						6		40			2		1	49
Yuba							1	39	1				1	42
Totals	3	7	57	16	24	233	403	4,369	27	9	104	170	153	5,575

TABLE No. 23—Continued.

Miscellaneous School Statistics, Showing Number of Certificates Issued by County Boards of Education and Fees Collected for Same, for the School Years Ending June 30, 1917 and 1918.

Counties	Certicates issued on examinations				Certificates issued on credentials				Amount of fees for examinations and certificates	
	To men		To women		To men		To women			
	1916-17	1917-18	1916-17	1917-18	1916-17	1917-18	1916-17	1917-18	1917-18	1916-17
Alameda	1	--------	8	11	79	87	296	357	$828	$888
Alpine	--------	--------	--------	--------	--------	--------	3	--------	6	--------
Amador	1	--------	1	--------	1	3	16	16	68	62
Butte	--------	1	3	2	9	8	44	43	128	146
Calaveras	1	--------	4	2	--------	2	14	14	70	54
Colusa	1	--------	1	--------	2	2	17	19	58	46
Contra Costa	1	--------	7	13	5	8	61	62	170	166
Del Norte	--------	--------	1	2	--------	1	--------	2	8	10
El Dorado	2	--------	10	5	--------	2	9	13	84	52
Fresno	2	--------	2	1	30	42	164	187	394	460
Glenn	1	1	2	2	6	4	16	19	62	80
Humboldt	--------	2	3	--------	11	11	40	46	156	168
Imperial	--------	--------	2	--------	18	12	70	86	186	196
Inyo	--------	--------	--------	--------	4	1	18	23	44	48
Kern	2	1	13	4	7	15	85	124	234	310
Kings	--------	1	6	--------	9	9	53	40	124	100
Lake	--------	--------	--------	--------	1	2	12	15	38	42
Lassen	--------	--------	--------	3	3	5	25	30	70	76
Los Angeles	5	--------	13	13	197	182	1,587	1,011	3,650	2,446
Madera	--------	--------	2	--------	3	6	28	34	70	94
Marin	--------	--------	--------	--------	3	7	32	37	70	88
Mariposa	--------	--------	2	1	--------	--------	9	10	2,400	26
Mendocino	--------	--------	8	5	8	2	36	65	122	150
Merced	--------	1	4	1	5	4	47	55	130	132
Modoc	--------	--------	1	3	--------	1	10	12	18	50
Mono	--------	--------	--------	--------	--------	--------	1	2	2	4
Monterey	--------	--------	2	--------	1	7	35	59	108	152
Napa	1	--------	8	6	3	--------	19	17	100	92
Nevada	--------	--------	1	5	4	4	16	17	72	90
Orange	--------	--------	3	--------	24	11	78	104	110	232
Placer	--------	--------	1	1	10	9	39	49	102	116
Plumas	1	--------	--------	--------	1	1	8	12	20	26
Riverside	--------	--------	--------	--------	16	26	95	95	1,238	264
Sacramento	1	--------	16	10	15	13	61	48	308	236
San Benito	--------	--------	--------	--------	--------	3	12	20	36	58
San Bernardino	--------	--------	1	2	17	19	92	121	228	358
San Diego	2	--------	1	--------	21	17	147	152	376	358
San Francisco	--------	--------	--------	14	25	54	301	192	652	690
San Joaquin	1	--------	12	--------	20	25	58	73	266	282
San Luis Obispo	--------	--------	8	5	6	4	39	47	120	128
San Mateo	--------	--------	6	1	1	2	33	25	92	80
Santa Barbara	--------	--------	3	--------	6	6	53	78	122	186
Santa Clara	--------	--------	2	--------	24	22	137	121	330	288
Santa Cruz	--------	--------	5	4	1	4	19	27	72	76
Shasta	1	--------	5	--------	8	4	36	31	120	148
Sierra	--------	--------	--------	3	2	1	9	8	28	22
Siskiyou	--------	1	2	5	10	3	35	42	120	106
Solano	--------	--------	5	12	8	6	26	38	122	142
Sonoma	--------	--------	8	1	8	7	46	75	170	208
Stanislaus	--------	--------	1	1	22	20	87	100	230	240
Sutter	1	--------	1	--------	4	1	14	17	54	40
Tehama	--------	--------	--------	1	6	1	42	40	96	82
Trinity	--------	--------	5	2	--------	2	2	7	22	22
Tulare	4	--------	2	6	19	24	92	93	268	324
Tuolumne	1	--------	4	--------	--------	--------	5	5	22	32
Ventura	--------	--------	--------	2	4	7	61	59	130	130
Yolo	--------	--------	--------	1	5	5	23	40	76	100
Yuba	--------	1	4	--------	5	9	19	38	82	98
Totals	30	9	199	149	697	730	4,432	4,172	$14,082	$11,300

TABLE No. 23—Continued.

Miscellaneous School Statistics, Showing City Expenses for Schools, Expenses of Office of City Superintendent, and Other Expenses for School Year Ending June 30, 1917.

Counties	Annual salary of superintendent and assistants	Traveling expenses of superintendent	Other expenses	Total for year
Alameda	$19,549 20	$207 95	$669 05	$20,426 20
Alpine				
Amador				
Butte	5 350 00		200 00	5,550 00
Calaveras				
Colusa				
Contra Costa	4,300 00			4,300 00
Del Norte				
El Dorado				
Fresno	8,240 00			8,240 00
Glenn				
Humboldt	3,340 00	81 00	616 00	4,037 00
Imperial				
Inyo				
Kern	4,820 00			4,820 00
Kings				
Lake				
Lassen				
Los Angeles	169,240 00	1,330 63	870 00	171,440 63
Madera				
Marin	3,000 00			3,000 00
Mariposa				
Mendocino				
Merced				
Modoc				
Mono				
Monterey	1,525 00		31 00	1,556 00
Napa				
Nevada	4,100 00	93 70		4,193 70
Orange	4,600 00	53 80		4,653 80
Placer				
Plumas				
Riverside	3,420 00		198 08	3,618 08
Sacramento	8,955 92	76 80		9,032 72
San Benito				
San Bernardino	2,500 00	240 00	2,100 00	4,840 00
San Diego	14,536 00	360 00		14,896 00
San Francisco	37,640 00			37,640 00
San Joaquin	9,720 00			9,720 00
San Luis Obispo	2,500 00	36 50	22 75	2,559 25
San Mateo				
Santa Barbara	3,000 00			3,000 00
Santa Clara	5,200 00	38 25	75 00	5,313 25
Santa Cruz	3,300 00		145 57	3,445 57
Shasta				
Sierra				
Siskiyou				
Solano	3,240 00	54 84	65 00	3,359 84
Sonoma	3,000 00			3,000 00
Stanislaus	3,000 00			3,000 00
Sutter				
Tehama				
Trinity				
Tulare				
Tuolumne				
Ventura	2,100 00		15 00	2,115 00
Yolo				
Yuba	600 00			600 00
Totals	$330,776 12	$2,573 47	$5,007 45	$338,357 04

TABLE No. 23—Continued.

Miscellaneous School Statistics, Showing City Expenses for Schools, Expenses of Office of City Superintendents, and City Boards of Education, for the School Year Closing June 30, 1918.

Counties	Annual salary paid superintendent and assistants	Traveling expenses	Other expenses	Total for year
Alameda	$70,030 48	$970 13	$11,735 55	$82,736 16
Alpine				
Amador				
Butte	5,455 00		200 00	5,655 00
Calaveras				
Colusa				
Contra Costa				
Del Norte				
El Dorado				
Fresno	8,302 62		1,132 30	9,434 92
Glenn				
Humboldt	4,140 00	110 00	433 78	4,683 78
Imperial				
Inyo				
Kern	4,820 00	17 00	738 75	5,575 75
Kings				
Lake				
Lassen				
Los Angeles	92,454 15	4,330 54	9,884 98	106,669 67
Madera				
Marin	2,750 00			2,750 00
Mariposa				
Mendocino				
Merced				
Modoc				
Mono				
Monterey	1,525 00		72 32	1,597 32
Napa				
Nevada	4,200 00	36 66		4,236 66
Orange	4,920 00			4,920 00
Placer				
Plumas				
Riverside	3,720 00	288 39	136 76	4,145 15
Sacramento	8,892 60	250 00	1,384 30	10,526 90
San Benito				
San Bernardino	4,820 00	304 21	121 68	5,245 89
San Diego	14,260 00	60 00	100 00	14,420 00
San Francisco				
San Joaquin	9,960 00		100 00	10,060 00
San Luis Obispo				
San Mateo				
Santa Barbara	3,500 00			3,500 00
Santa Clara	9,335 00	9 75	327 24	9,671 99
Santa Cruz				
Shasta				
Sierra				
Siskiyou				
Solano	3,550 00	73 71	505 00	4,128 71
Sonoma	6,000 00			6,000 00
Stanislaus	2,700 00			2,700 00
Sutter				
Tehama				
Trinity				
Tulare				
Tuolumne				
Ventura	2,300 00		15 00	2,315 00
Yolo				
Yuba	600 00			600 00
Totals	$268,234 85	$6,450 39	$26,887 66	$301,572 90

NOTE.—The San Francisco City and County Board is classed as a county board this year.

TABLE No. 23—Continued.

Expenditures of Superintendent of Public Instruction and State Board of Education for the Years 1916-17 and 1917-18.

Expenditures of Superintendent of Public Instruction.

July 1, 1916–June 30, 1917—		July 1, 1917–June 30, 1918—	
Traveling and contingent office expenses	$1,626 49	Traveling and contingent office expenses	$1,458 15
Postage, telegraph and express	1,232 42	Postage, telegraph and express	488 06
For printing	14,910 59	For printing	13,281 41
Salary, Superintendent Public Instruction	5,000 00	Salary, Superintendent Public Instruction	5,000 00
Salary, office force	10,480 00	Salary, office force	10,480 00
Totals	$33,249 50	Total	$30,707 62

Receipts and Expenditures of State Board of Education.

		1916-17	1917-18
Fees.			
Life diploma and high school special credential fees		$5,832 66	$4,676 42
Fees, high school textbooks			6,100 00
Total fees collected		$5,832 66	$10,776 42
Expenditures.			
Traveling and contingent fund—			
Salaries		$8,071 12	$12,384 86
Postage		2,646 54	2,500 64
Telephone and telegraph		471 07	350 33
Miscellaneous		512 69	297 70
Express and drayage		123 81	114 63
Supplies		542 36	496 78
Commissioners (travel)		2,320 60	3,351 77
Board members		5,416 28	6,184 14
Printing		4,940 78	5,402 58
Office fittings		409 65	1,282 60
War work			356 35
Critic readers			3,331 00
Publicity		69 65	
Life diplomas		3,113 40	*
High school credentials		517 36	
		$29,155 31	$36,053 38
Salaries of Commissioners and Directors of Education		$12,000 00	$13,653 35
Textbook appropriation—			
Salaries			$800 00
Critic readers		$100 00	75 00
Office fittings		31 00	
		$131 00	$875 00
Vocational education—			
(A) Salaries of teachers, supervisors and directors of agricultural subjects			$8,393 33
(B) Salaries of teachers of trade, home economics and industrial subjects			16,294 34
(C) Training of teachers—			
Agriculture	$2,534 89		
Home economics	3,120 35		
Trade and industrial subjects	3,101 49		
			8,756 73
(Of this sum, half is to be charged against the state and half against the federal government, under the Smith-Hughes act.)			$33,444 40
Physical education—			
Miscellaneous			$24 00
Office fittings			526 90
Salaries			1,105 68
Printing			104 83
Postage			154 00
Supplies			166 50
Travel			713 68
			$2,795 59
Total expenditures—			
Traveling and contingent fund		$29,155 31	$36,053 38
Salaries of Commissioners and Directors of Education		12,000 00	13,653 35
Textbook appropriation		131 00	875 00
Vocational education			33,444 40
Physical education			2,795 59
Totals		$41,286 31	$86,821 72

*Included in printing. State Printer now makes diplomas.

Section 6.

STATE TEXTBOOKS.

TABLE NO. 24. Showing Number of Textbooks Distributed Free; Number Sold to Individuals, Dealers, Orphan Asylums; Summary of Textbooks Sold and Distributed Free Since 1887; Financial Statement Showing Cost of Manufacture and Distribution of State Textbooks and the Amount of Money Appropriated for Such Purposes.

TABLE No. 24.

Number of Books Distributed Free to the Elementary Schools of the State From July 1, 1916, to June 30, 1917, and the Amount of Royalty Paid for the Use of Plates Belonging to the Textbooks Companies.

Books	Number of books	Cost of manufacture	Royalty	To royalty fund	Price
Primer	51,147	$0.102	$0.048	$2,455 07	15 cents
First Reader	160	.106	.054	8 64	16 cents
Second Reader	26,990	.12	.06	1,619 40	18 cents
Third Reader	10,848	--------	.0575	650 88	— cents
Fourth Reader	7,756	.15	.09	698 04	24 cents
Fifth Reader	8,304	.15	.09	747 36	24 cents
Sixth Reader	48,468	.20	--------	--------	20 cents
Seventh Reader	28,244	.20	--------	--------	20 cents
Eighth Reader	--------	.27	--------	--------	27 cents
Speller—Book I	30,059	.115	.025	751 48	14 cents
Speller—Book II	18,592	.115	.025	464 80	14 cents
First Book in Arithmetic	24,116	.1275	.0525	1,266 09	18 cents
Advanced Arithmetic	18,294	.14	.09	1,646 46	23 cents
English Lessons—Book I	13,182	.1625	.0675	889 78	23 cents
English Lessons—Book II	13,325	.17	.09	1,199 25	26 cents
Introductory History	46,277	.22	.08	3,702 16	30 cents
Brief History	16,727	.26	.15	2,509 05	41 cents
Introductory Geography	23,469	.23	.09	2,112 21	32 cents
Advanced Geography	25,000	.39	.15	3,750 00	54 cents
Primer of Hygiene	9,302	.12	.06	558 12	18 cents
Civics	7,139	.185	.125	892 38	31 cents
Copy Book I	69,835	.02	.01	698 35	3 cents
Copy Book II	60,440	.02	.01	604 40	3 cents
Copy Book III	64,890	.02	.01	648 90	3 cents
Copy Book IV	59,275	.02	.01	592 75	3 cents
Copy Book V	56,807	.02	.01	568 07	3 cents
Copy Book VI	49,009	.02	.01	490 09	3 cents
Copy Book VII	41,634	.02	.01	416 34	3 cents
Copy Book VIII	36,073	.02	.01	360 73	3 cents
Primer (old)	6,948	.102	.048	333 50	15 cents
First Reader (old)	13,560	.102	.048	650 86	15 cents
Second Reader (old)	10,967	.1275	.0525	575 76	18 cents
Third Reader (old)	--------	13	.06	--------	19 cents
Introductory History (old)	5,385	.16	.15	807 75	31 cents
Writing—Book I (old)	61	.03	.01	61	4 cents
Writing—Book II (old)	38	.03	.01	38	4 cents
Writing—Book III (old)	52	.03	.01	52	4 cents
Writing—Book IV (old)	69	.03	.01	69	4 cents
Writing—Book V (old)	42	.03	.01	42	4 cents
English Lessons—Book I (old)	--------	--------	.08	--------	8 cents
English Lessons—Book II (old)	70	--------	.12	8 40	
Totals	902,554	--------	--------	$32,679 69	

TABLE No. 24—Continued.

Number of Textbooks Distributed Free to the Elementary Schools of the State, Cost per Copy of Royalty for Use of Plates and the Amount Paid on Royalty for Use of Plates, From July 1, 1917, to June 30, 1918.

Books	Number of books	Cost of manufacture	Royalty	To royalty fund	Price
Primer	23,825	$0.102	$0.048	$1,143 60	15 cents
First Reader	52,958	.106	.054	2,859 74	16 cents
Second Reader	31,603	.12	.06	1,896 18	18 cents
Third Reader	24,169		.0575	1,389 71	— cents
Fourth Reader	6,507	.15	.09	585 63	24 cents
Fifth Reader	6,849	.15	.09	616 41	24 cents
Sixth Reader	14,030	.20			20 cents
Seventh Reader	22,167	.20			20 cents
Eighth Reader	17,727	.27			27 cents
Speller—Book I	29,425	.115	.025	735 62	14 cents
Speller—Book II	16,705	.115	.025	417 62	14 cents
First Book in Arithmetic	24,772	.1275	.0525	1,300 53	18 cents
Advanced Arithmetic	17,496	.14	.09	1,574 64	23 cents
English Lessons—Book I	9,513	.1625	.0675	642 13	23 cents
English Lessons—Book II	8,348	.17	.09	751 32	26 cents
Introductory History	32,175	.22	.08	2,574 00	30 cents
Brief History	12,706	.26	.15	1,905 90	41 cents
Introductory Geography	28,917	.23	.09	2,602 53	32 cents
Advanced Geography	27,176	.39	.15	4,076 40	54 cents
Primer of Hygiene	8,987	.12	.06	539 22	18 cents
Civics	6,181	.185	.125	772 62	31 cents
Copy Book I	26,991	.02	.01	269 91	3 cents
Copy Book II	25,248	.02	.01	252 48	3 cents
Copy Book III	27,030	.02	.01	270 30	3 cents
Copy Book IV	27,098	.02	.01	270 98	3 cents
Copy Book V	25,311	.02	.01	253 11	3 cents
Copy Book VI	23,785	.02	.01	237 85	3 cents
Copy Book VII	21,194	.02	.01	211 94	3 cents
Copy Book VIII	18,863	.02	.01	188 63	3 cents
Primer (old)	124	.102	.048	5 95	15 cents
First Reader (old)	798	.102	.048	38 30	15 cents
Second Reader (old)	15	.1275	.0525	79	18 cents
Third Reader (old)	8,753	.13	.06	525 18	19 cents
Introductory History (old)	3	.16	.15	45	31 cents
Writing—Book I (old)	95	.03	.01	95	4 cents
Writing—Book II (old)	130	.03	.01	1 30	4 cents
Writing—Book III (old)	92	.03	.01	92	4 cents
Writing—Book IV (old)	96	.03	.01	96	4 cents
Writing—Book V (old)	98	.03	.01	98	4 cents
English Lessons—Book I (old)			.08		8 cents
Fourth Reader (new)	23,278		.085	1,978 63	
Totals	651,238			$30,893 41	

TABLE No. 24—Continued.

Number of Textbooks Sold to Dealers, Orphan Asylums, Private Schools and Individuals From July 1, 1916, to June 30, 1917, Cost per Book of Manufacture, Amount of Money Paid Into State Treasury From Sale of Books, etc.

Books	Number of books	Cost of manufacture	To school book fund	Royalty	To royalty fund	Price	Amount of sales
Primer	3,028	$0.102	$308 87	$0.048	$145 33	15 cents	$454 20
First Reader	38	.106	4 03	.054	2 05	16 cents	6 08
Second Reader	1,258	.12	150 96	.06	75 48	18 cents	226 44
Third Reader	1,627	.13	211 51	.06	97 62	19 cents	309 13
Fourth Reader	941	.15	141 15	.09	84 69	24 cents	225 84
Fifth Reader	634	.15	95 10	.09	57 06	24 cents	152 16
Sixth Reader	422	.20	84 40	---------	-----------	20 cents	84 40
Seventh Reader	233	.20	46 60	---------	-----------	20 cents	46 60
Speller—Book I	3,986	.115	458 38	.025	99 66	14 cents	558 04
Speller—Book II	1,782	.115	204 93	.025	44 55	14 cents	249 48
First Book in Arithmetic	2,924	.1275	372 80	.0525	153 52	18 cents	526 32
Advanced Arithmetic	1,451	.14	203 14	.09	130 59	23 cents	333 73
English Lessons—Book I	1,511	.1625	245 53	.0675	102 00	23 cents	347 53
English Lessons—Book II	1,313	.17	223 21	.09	118 17	26 cents	341 38
Introductory History	1,369	.22	301 18	.08	109 52	30 cents	410 70
Brief History	1,293	.26	336 18	.15	193 95	41 cents	530 13
Introductory Geography	1,844	.23	424 12	.09	165 96	32 cents	590 08
Advanced Geography	1,379	.39	537 81	.15	206 85	54 cents	744 66
Primer of Hygiene	476	.12	57 12	.06	28 56	18 cents	85 68
Civics	501	.185	92 70	.125	62 61	31 cents	155 31
Copy Book I	1,229	.02	24 58	.01	12 29	3 cents	36 87
Copy Book II	966	.02	19 32	.01	9 66	3 cents	28 98
Copy Book III	857	.02	17 14	.01	8 57	3 cents	25 71
Copy Book IV	775	.02	15 50	.01	7 75	3 cents	23 25
Copy Book V	678	.02	13 56	.01	6 78	3 cents	20 34
Copy Book VI	605	.02	12 10	.01	6 05	3 cents	18 15
Copy Book VII	771	.02	15 42	.01	7 71	3 cents	23 13
Copy Book VIII	646	.02	12 92	.01	6 46	3 cents	19 38
Primer (old)	137	.102	13 97	.048	6 58	15 cents	20 55
First Reader (old)	2,304	.102	235 00	.048	110 60	15 cents	345 60
Second Reader (old)	1,359	.1275	173 26	.0525	71 36	18 cents	244 62
Introductory History (old)	52	.16	8 32	.15	7 80	31 cents	16 12
Writing—Book I (old)	494	.03	14 82	.01	4 94	4 cents	19 76
Writing—Book II (old)	490	.03	14 70	.01	4 90	4 cents	19 60
Writing—Book III (old)	488	.03	14 64	.01	4 88	4 cents	19 52
Writing—Book IV (old)	532	.03	15 96	.01	5 32	4 cents	21 28
Writing—Book V (old)	690	.03	20 70	.01	6 90	4 cents	27 60
English Lessons—Book I (old)	24	---------	-----------	.08	1 92	8 cents	1 92
English Lessons—Book II (old)	356	---------	-----------	.12	42 72	12 cents	42 72
Totals	41,463	---------	$5,141 63	---------	$2,211 36	-----------	$7,352 99

TABLE No. 24—Continued.

Number of Textbooks Sold to Dealers, Orphan Asylums, Private Schools and Individuals From July 1, 1917, to June 30, 1918, Cost per Book of Manufacture, Amount of Money Paid Into State Treasury From Sale of Books, etc.

Books	Number of books	Cost of manufacture	To school book fund	Royalty	To royalty fund	Price	Amount of sales
Primer	2,497	$0.102	$254 69	$0.048	$119 86	15 cents	$374 55
First Reader	2,388	.106	253 14	.054	128 94	16 cents	382 08
Second Reader	1,970	.12	236 40	.06	118 20	18 cents	354 60
Third Reader	707	---------	114 88	.0575	40 66	— cents	155 54
Fourth Reader	587	.15	88 05	.09	52 83	24 cents	140 88
Fifth Reader	619	.15	92 85	.09	55 71	24 cents	148 56
Sixth Reader	581	.20	116 20	---------	-----------	20 cents	116 20
Seventh Reader	484	.20	96 80	---------	-----------	20 cents	96 80
Eighth Reader	165	.27	44 55	---------	-----------	27 cents	44 55
Speller—Book I	2,804	.115	322 46	.025	70 10	14 cents	392 56
Speller—Book II	1,619	.115	186 18	.025	40 48	14 cents	226 66
First Book in Arithmetic	1,956	.1275	249 39	.0525	102 69	18 cents	352 08
Advanced Arithmetic	1,550	.14	217 00	.09	139 50	23 cents	356 50
English Lessons—Book I	895	.1625	145 45	.0675	60 40	23 cents	205 85
English Lessons—Book II	773	.17	131 41	.09	69 57	26 cents	200 98
Introductory History	1,228	.22	270 16	.08	98 24	30 cents	368 40
Brief History	754	.26	196 04	.15	113 10	41 cents	309 14
Introductory Geography	1,410	.23	324 30	.09	126 90	32 cents	451 20
Advanced Geography	1,416	.39	552 24	.15	212 40	54 cents	764 64
Primer of Hygiene	512	.12	61 44	.06	30 72	18 cents	92 16
Civics	576	.185	106 56	.125	72 00	31 cents	178 56
Copy Book I	755	.02	15 10	.01	7 55	3 cents	22 65
Copy Book II	421	.02	8 42	.01	4 21	3 cents	12 63
Copy Book III	456	.02	9 12	.01	4 56	3 cents	13 68
Copy Book IV	384	.02	7 68	.01	3 84	3 cents	11 52
Copy Book V	402	.02	8 04	.01	4 02	3 cents	12 06
Copy Book VI	301	.02	6 02	.01	3 01	3 cents	9 03
Copy Book VII	252	.02	5 04	.01	2 52	3 cents	7 56
Copy Book VIII	347	.02	6 94	.01	3 47	3 cents	10 41
Primer (old)	40	.102	4 08	.048	1 92	15 cents	6 00
First Reader (old)	76	.102	7 75	.048	3 65	15 cents	11 40
Second Reader (old)	41	.1275	5 24	.0525	2 14	18 cents	7 38
Third Reader (old)	744	.13	96 72	.06	44 64	19 cents	141 36
Introductory History (old)	20	.16	3 20	.15	3 00	31 cents	6 20
Writing—Book I (old)	267	.03	8 01	.01	2 67	4 cents	10 68
Writing—Book II (old)	272	.03	8 16	.01	2 72	4 cents	10 88
Writing—Book III (old)	277	.03	8 31	.01	2 77	4 cents	11 08
Writing—Book IV (old)	272	.03	8 16	.01	2 72	4 cents	10 88
Writing—Book V (old)	269	.03	8 07	.01	2 69	4 cents	10 76
English Lessons—Book I (old)	---------	---------	-----------	.08	-----------	8 cents	----------
Fourth Reader (new)	344	.215	73 96	.085	29 24	30 cents	103 20
Totals	31,431	---------	$4,358 21	---------	$1,783 64	----------	$6,141 85

TABLE No. 24—Continued.

SUMMARY OF TEXTBOOKS.

Sold and Distributed Free: 1887-1918.

Period	Number of books sold Column (a)	Number of books distributed free Column (b)	School book fund Column (c)	Royalty fund Column (d)	Amount Column (e)
Prior to July 1, 1904	4,052,327	--------------	$1,429,297 52	$10,821 75	$1,440,119 27
July 1, 1904, to June 30, 1906	857,749	--------------	310,105 09	87,471 36	395,272 38
July 1, 1906, to June 30, 1908	1,072,575	--------------	292,748 67	101,880 05	394,628 72
July 1, 1908, to June 30, 1910	1,178,594	--------------	247,944 36	75,859 56	323,803 92
July 1, 1910, to June 30, 1911	683,079	--------------	152,341 82	41,922 60	194,264 42
July 1, 1911, to June 30, 1912	683,527	--------------	159,113 15	42,100 08	201,213 23
July 1, 1912, to June 30, 1913	476,241	477,933	78,352 70	55,321 72	106,037 84
July 1, 1913, to June 30, 1914	13,526	1,379,154	1,645 48	86,140 38	2,319 56
July 1, 1914, to June 30, 1915	35,957	493,159	4,628 53	30,188 87	6,716 68
July 1, 1915, to June 30, 1916	32,766	491,970	4,331 32	26,493 15	6,370 06
July 1, 1916, to June 30, 1917	41,463	902,554	5,141 63	34,891 05	7,352 99
July 1, 1917, to June 30, 1918	31,431	651,238	4,358 21	32,677 05	6,141 85
Totals	9,159,235	4,396,008	$2,690,008 48	$625,767 62	$3,084,240 92

Columns (a) and (b) are self-explanatory.

Column (c) is the total amount of money paid into the school book fund as a result of the sale of books listed in column (a).

Column (d) is the amount of money paid to the texbook companies for the use of plates in the manufacture of all state textbooks. This includes both books sold and books distributed free.

Column (e) is the total amount of money paid into the state treasury as the result of sales, column (a).

TABLE No. 24—Continued.

Financial Statement of the Schoolbook Fund From July 1, 1916, to June 30, 1917.

Month	Expenditures						Receipts			
	For royalty	For printing	For freight and postage	For salary	Misc.	Total	From sales	From refund	Total	Balance
Balance from sixty-seventh fiscal year (1916-1917)										$374,624 91
July	$708 34		$709 10	$90 00	$18 00	$1,525 44	$39 26		$39 26	
August	1,000 00	$14,339 49	1,588 50	120 00		17,047 99	1,894 65	$662 58	2,557 23	
September		8,231 55	209 08	50 00	15 00	8,505 63	1,399 46		1,399 46	
October	23,640 41	8,266 17	448 67	50 00		32,405 25	657 37		657 37	
November		1,872 00	196 29	50 00	31 60	2,149 89	645 86	117 25	763 11	
December			54 92	50 00		104 92	149 20		149 20	
January	4,112 14	8,347 77	611 51	50 00		13,121 42	741 70		741 70	
February		1,384 01	236 28	50 00	5 00	1,675 29	393 28		393 28	
March		13,025 39	165 35	50 00		13,240 74	503 25		503 25	
April	7,706 89	15,171 93	31 50	50 00		22,960 32	249 85		249 85	
May		13,263 89	116 07	50 00		13,429 96	84 82	3 85	88 67	
June			2 42	50 00		52 42	319 40		319 40	
Totals	$37,167 78	$83,902 20	$4,369 69	$710 00	$69 60	$126,219 27	$7,078 10	$783 68	$7,861 78	7,861 78
Grand total										$382,486 69
Expenditures										126,219 27
Balance										$256,267 42

TABLE No. 24—Continued.

Financial Statement of the Schoolbook Fund From July 1, 1917, to June 30, 1918.

Month	Expenditures						Receipts			Balance
	For royalty	For printing	For freight and postage	For salary	Misc.	Total	From sales	From refund	Total	
Balance from sixty-eighth fiscal year (1917-1918)										$256,267 42
School book appropriation										150,000 00
Total amount in school book fund July 1, 1917										$406,267 42
July	$431 60	$16,391 95	$563 61			$17,387 16	$330 17		$330 17	
August			659 48	$40 00		699 48	1,673 22		1,673 22	
September		4,298 98	703 82	40 00		5,042 80	609 05		609 05	
October	21,200 78		506 39	40 00		21,747 17	651 60		651 60	
November		2,937 01	167 71	40 00		3,144 72	527 22		527 22	
December		5,190 68	261 48	40 00		5,492 16	84 66		84 66	
January	2,321 64	4,927 06	383 80	47 09		7,679 59	28 80		28 80	
February			517 63	50 00	$277 20	844 83	947 15		947 15	
March		14,569 96	208 19	50 00		14,828 15	254 54		254 54	
April	9,506 35	17,846 58	65 78	50 00		27,468 71	54 32	$4 80	59 12	
May		1,793 50	84 82	50 00		1,928 32	181 39		181 39	
June		13,643 43	119 96	75 00		13,838 39	130 82		130 82	
Totals	$33.460 37	$81,599 15	$4,242 67	$522 09	$277 20	$120,101 48	$5,472 94	$4 80	$5,477 74	5,477 74
Grand total										$411,745 16
Expenditures										120,101 43
Balance										$291,643 68

Section 7.

STATE NORMAL SCHOOLS.

TABLE No. 25. Showing Teachers Employed; Pupils Enrolled in Normal Departments and in Training Department; Receipts from all Sources and Expenditures for all Purposes; Valuation of all Property and Total Number of Books in Libraries; Number of Graduates, Boys and Girls, for 1917 and 1918; and Total Number of Graduates, Boys and Girls by Classes Since Organization.

TABLE No. 25.

Statistics of State Normal Schools, Showing Number of Teachers Employed.

Name and location of school	Men		Women		Total	
	1916-17	1917-18	1916-17	1917-18	1916-17	1917-18
Chico	9	8	13	13	22	21
Fresno	10	12	15	18	25	30
Humboldt	6	7	7	8	13	15
Los Angeles	19	20	92	68	111	88
San Diego	7	6	18	19	25	25
San Francisco	8	8	34	37	42	45
San Jose	12	15	41	52	53	67
Santa Barbara	10	8	22	16	32	24
Totals	81	84	242	231	323	315

Pupils Enrolled—Normal Department.

Name and location of school	Boys		Girls		Total	
	1916-17	1917-18	1916-17	1917-18	1916-17	1917-18
Chico	68	22	339	256	407	278
Fresno	27	15	426	316	453	331
Humboldt	14	17	77	140	91	157
Los Angeles	91	57	1,589	1,240	1,680	1,297
San Diego	22	6	593	456	615	462
San Francisco	7	5	722	674	729	679
San Jose	64	33	940	727	1,004	760
Santa Barbara	65	49	325	309	390	358
Totals	358	204	5,011	4,118	5,369	4,322

Pupils Enrolled—Training Department.

Name and location of school	Boys		Girls		Total	
	1916-17	1917-18	1916-17	1917-18	1916-17	1917-18
Chico	203	233	253	252	456	485
Fresno	207	174	165	176	372	350
Humboldt	48	55	41	69	89	124
Los Angeles	228	285	207	246	435	531
San Diego	219	226	248	257	467	483
San Francisco	420	385	399	393	819	778
San Jose	355	340	371	365	726	705
Santa Barbara*	----------	----------	----------	----------	----------	----------
Totals	1,680	1,698	1,684	1,758	3,364	3,456

*Use city schools.

TABLE No. 25—Continued.

Statistics of State Normal Schools, Showing Receipts and Expenditures for Years Closing June 30, 1917 and 1918.

Name and location of school	Balance on hand June 30, 1916	Received from state appropriation	Received from tuition	Received from miscellaneous sources	Total receipts
1916-1917					
Chico	$23,778 53	$52,125 00	------------	$1,563 03	$77,466 56
Fresno	167,100 80	61,335 00	$1,830 00	538 57	230,804 42
Humboldt	6,285 37	35,642 50	------------	390 95	42,318 82
Los Angeles	11,294 23	199,802 45	------------	------------	211,096 68
San Diego	7,045 26	66,310 00	------------	1,807 53	75,162 79
San Francisco	17,588 31	69,850 00	7 50	21,116 92	108,562 73
San Jose	20,705 46	124,450 00	------------	507 35	145,662 81
Santa Barbara	15,840 32	39,600 00	------------	4,443 08	59,883 40
Totals	$269,638 28	$649,114 95	$1,837 50	$30,367 43	$950,958 21
1917-1918					
Chico	$2,899 65	$87,455 00	------------	$1,456 86	$91,811 51
Fresno	2,123 93	158,050 00	$826 00	96 43	161,096 36
Humboldt	107 51	282,680 00	------------	164 52	282,952 03
Los Angeles	4,865 25	222,186 53	------------	------------	227,051 78
San Diego	707 49	83,600 00	------------	2,241 00	86,548 49
San Francisco	10,108 37	84,350 00	8 50	2,662 52	97,129 39
San Jose	10,606 93	212,700 00	------------	------------	223,306 93
Santa Barbara	11,814 25	70,150 00	------------	4,838 45	86,802 70
Totals	$43,233 38	$1,201,171 53	$834 50	$11,459 78	$1,256,699 19

Expenditures 1916-17 and 1917-18.

Name and location of school	Paid for salary of teachers	Paid for janitor, labor and supplies	Paid for sites, buildings and furniture	Paid for library books and apparatus	Total expenditure	Balance on hand at close of year
1916-1917						
Chico	$38,416 06	$24,248 67	$4,629 81	$1,009 45	$68,303 99	$9,162 57
Fresno	50,062 69	36,234 30	138,919 19	1,369 79	226,585 97	4,218 45
Humboldt	25,766 62	7,740 27	263 98	1,487 20	35,267 07	7,051 75
Los Angeles	173,704 50	30,471 30	------------	------------	204,175 80	6,920 88
San Diego	39,506 17	29,325 54	1,090 21	1,442 71	71,364 63	3,798 16
San Francisco	56,782 72	21,195 10	18,049 56	2,426 24	98,453 62	10,109 11
San Jose	85,451 17	34,302 84	4,084 75	1,409 53	125,248 29	20,414 52
Santa Barbara	34,467 48	12,483 72	5,633 14	314 11	52,898 45	6,984 95
Totals	$510,443 41	$196,001 74	$172,670 64	$9,459 03	$882,297 82	$68,660 39
1917-1918						
Chico	$36,496 79	$23,522 16	$475 26	$988 60	$61,482 81	$30,328 70
Fresno	58,575 62	12,618 68	2,034 85	1,576 87	74,806 02	86,290 34
Humboldt	24,278 13	9,727 15	11,052 86	754 78	45,812 92	237,139 11
Los Angeles	173,441 43	34,573 96	------------	------------	208,015 39	19,036 39
San Diego	50,956 99	14,086 80	13,198 92	1,335 78	79,578 49	6,970 00
San Francisco	57,050 25	24,285 08	1,521 64	1,318 65	84,175 62	12,953 77
San Jose	90,073 00	30,839 68	332 50	376 71	121,621 89	101,685 04
Santa Barbara	34,567 85	9,797 61	19,855 49	421 79	64,642 74	22,159 96
Totals	$525,440 06	$159,451 12	$48,471 52	$6,773 18	$740,135 88	$516,563 31

TABLE No. 25—Continued.

Statistics of State Normal Schools, Showing Valuation of Property for Years Closing June 30, 1917 and 1918.

Name and location of school	Area of Grounds (acres)	Valuation of grounds	Valuation of buildings	Valuation of furniture	Valuation of library books	Valuation of apparatus	Valuation of supplies on hand	Total valuation of all property
1916-1917								
Chico	11	$75,000	$233,000	$14,960	$18,928	$10,340	$4,370	$356,598
Fresno	25	37,000	370,000	15,335	6,000	11,085	500	439,920
Humboldt	51	5,100	14,730	5,755	2,650	98	350	28,683
Los Angeles	25+	110,000	580,776	85,902	31,538	15,293	2,790	826,299
San Diego	16.5	100,000	210,160	24,000	15,012	6,395	300	355,867
San Francisco	1.73	120,000	120,000	25,500	11,500	3,000	7,563	287,563
San Jose	18.3	50,000	450,000	48,000	27,963	10,000	100	586,063
Santa Barbara	14	27,500	120,500	32,000	3,500	4,000	500	188,000
Totals	162.53	$524,600	$2,099,166	$251,452	$117,091	$60,211	$16,473	$3,068,993
1917-1918								
Chico	11	$67,000	$210,571	$15,000	$16,319	$9,076	$3,877	$321,843
Fresno	25	37,000	380,000	15,000	7,000	11,000	500	450,500
Humboldt	51	14,700	14,775	6,467	3,650	108	200	39,900
Los Angeles	25+	110,000	581,076	84,617	34,525	18,012	2,495	830,725
San Diego	16.5	100,000	210,160	24,400	15,802	6,395	200	356,557
San Francisco	1.73	110,000	130,000	26,440	12,192	2,247	516	280,955
San Jose	18.3	50,000	450,000	48,000	27,000	10,000	100	585,100
Santa Barbara	14	28,200	130,500	33,000	4,000	4,500	500	200,700
Totals	162.53	$516,900	$2,107,082	$252,084	$120,488	$61,338	$8,388	$3,066,280

Statistics of Normal Schools, Showing Number of Books in Libraries for Years Closing June 30, 1917 and 1918.

Name and location of school	On hand at beginning of year	Number bought	Number donated	Number lost or distroyed	Total at close of year
1916-1917					
Chico	21,272	1,534	169	1,943	21,032
Fresno	2,875	3,276	135	---------	6,286
Humboldt	2,057	1,418	107	7	3,575
Los Angeles	24,654	818	5	114	25,363
San Diego	15,603	1,944	87	610	17,024
San Francisco	17,414	3,721	32	2,214	18,953
San Jose	18,000	803	25	186	18,642
Santa Barbara	3,671	292	198	7	4,154
Totals	105,546	13,806	758	5,081	115,029
1917-1918					
Chico	21,032	1,418	150	437	22,163
Fresno	6,286	1,714	---------	---------	8,000
Humboldt	3,575	812	66	17	4,436
Los Angeles	25,363	2,231	63	162	27,495
San Diego	17,024	1,487	---------	4	18,507
San Francisco	18,953	3,474	11	222	22.216
San Jose	17,323	366	115	34	17,770
Santa Barbara	3,703	184	54	5	3,936
Totals	113,259	11,686	459	881	124,523

TABLE No. 25—Continued.

Statistics of State Normal Schools, Showing the Number of Graduates From Each School for the Years Closing June 30, 1917, and June 30, 1918, and the Total Since Organization.

	Number of graduates		Grand total since organization
	1916-17	1917-18	
Chico—			
Boys	25	8	245
Girls	144	114	1,515
Totals	169	122	1,760
Fresno—			
Boys	6	4	35
Girls	114	131	650
Totals	120	135	685
Humboldt—			
Boys	6	7	19
Girls	39	47	139
Totals	45	54	158
Los Angeles—			
Boys	26	45	354
Girls	584	725	6,175
Totals	610	770	6,529
San Diego—			
Boys	7		62
Girls	142	95	1,403
Totals	149	95	1,465
San Francisco—			
Boys	1	5	6
Girls	250	316	1,907
Totals	251	321	1,913
San Jose—			
Boys	20	11	550
Girls	343	376	7,022
Totals	363	387	7,572
Santa Barbara—			
Boys	19	19	128
Girls	84	58	649
Totals	103	77	777
Totals—			
Boys	110	99	1,399
Girls	1,700	1,862	19,460
Grand totals	1,810	1,961	20,859

Section 8.

CALIFORNIA POLYTECHNIC SCHOOL.

TABLE No. 26. Showing Number of Teachers Employed, Pupils Enrolled, Receipts and Valuation of School Property.

TABLE No. 26.

Statistics of California Polytechnic School, at San Luis Obispo, for 1917 and 1918.

By R. W. Ryder, Director.

			1917	1918
Number of teachers employed:				
Men			15	12
Women			6	6
Totals			21	18
Students enrolled, 1916-1917:				
First year	Men 32:	women 24		
Second year	Men 31;	women 11		
Third year	Men 22;	women 4		
Fourth year	Men 16;	women 8		
Specials	Men ---;	women 8		
Totals	Men 101;	women 55		
Graduates	Men 24;	women 11		
Students enrolled, 1917-1918:				
First year	Men 22;	women 14		
Second year	Men 21;	women 15		
Third year	Men 11;	women 4		
Fourth year	Men 13;	women 4		
Specials	Men 189;	women 47		
Totals	Men 256;	women 84		
Graduates	Men 12;	women 4		

Financial Statement, 1917-1918.

	1917	1918
Salaries—		
Appropriation	$37,500 00	$42,500 00
Balance	12 14	----------
Administration	5,137 79	8,101 42
Faculty	30,967 11	26,550 58
Employees	1,407 12	7,817 65
Balance	12	30 35
Grounds—		
Appropriation	3,500 00	3,500 00
Balance	37 06	----------
Expended	3,529 75	3,163 56
Balance	7 31	336 44
Library—		
Appropriation	850 00	1,000 00
Balance	268 93	----------
Expended	1,116 98	924 61
Balance	1 95	75 39
Printing—		
Appropriation	750 00	1,000 00
Balance	71	----------
Expended	750 00	596 05
Balance	71	403 95
Support—		
Appropriation	15,000 00	18,750 00
Balance	569 69	----------
Expended	15,544 76	17,392 30
Balance	24 93	1,357 70
Contingent fund—		
Balance	56 04	1,478 53
Receipts:		
Dining hall and dormitory	12,923 32	13,347 72
Creamery, dairy, animal industry and farm.		
Expended	11,500 83	10,603 65
Balance	1,478 53	*4,222 60
Emergency appropriation, Chapter 393, 1915—		
Appropriation	2,000 00	----------
Expended	1,991 39	----------
Balance	8 61	----------
Additional support, Chapter 236, 1917—		
Appropriation	6,000 00	----------
Expended	5,961 74	----------
Balance	38 26	----------
Special appropriations—		
Equipment, Chapter 291, 1915 (repairs and improvements)†	253 92	85 49
Expenditure	168 43	1 95
Balance	85 49	83 54
Furniture, Chapter 512, 1911:		
Balance	0	0
Expenditure	0	0
Valuation of Property.		
Area of grounds, acres	$311 04	$928 24
(Also have 600 acres on which only control water rights.)		
Value of grounds, shrubs, orchards, roads, water, sewer and heating systems	136,414 00	192,414 00
Value of buildings	176,600 00	176,600 00
Value of furniture	8,786 93	8,786 93
Value of apparatus	49,859 95	50,674 95
Value of stock and tools	14,881 36	15,382 29
Value of library	4,714 50	5,025 00
Totals	$391,256 74	$448,883 17

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*Approximate, as sixty-ninth fiscal year's business not yet closed.

†Chapter 291, 1915, expended by the Department of Engineering—above figures approximate.

Financial Statement, 1917-18—(Continued).

	1917	1918
Recapitulation.		
Total receipts	$79,467 89	$81,576 25
Total expenditures	77,907 47	75,769 88
Unexpended balance	$1,560 42	$5,806 37
Total value of property	$391,256 74	$448,883 17
Total books in library	3,143	3,350

Section 9.

INSTITUTION FOR THE DEAF AND THE BLIND.

TABLE No. 27. Enrollment, Number of Teachers, Receipts and Expenditures and Valuation of Property.

TABLE No. 27.

Showing Statistics California Institution for the Deaf and Blind.

By L. E. MILLIGAN, Principal.

The enrollment of pupils for the two years ending June 30, 1918, has been as follows:

	1916-17		1917-18	
Deaf boys	119		107	
Deaf girls	70		68	
		189		175
Blind boys	48		51	
Blind girls	50		48	
		98		99
Total enrollment, both classes		287		274

The number of teachers, including manual craft instructors, has been:

	1916-17		1917-18	
Deaf department—				
Teachers, men	13		13	
Teachers, women	13		13	
		26		26
Blind department—				
Teachers, men	5		5	
Teachers, women	9		9	
		14		14
Total, both departments		40		40

Financial Statement.

	1916-17	1917-18	Total
Receipts—			
Salaries and wages, balance July 1, 1916	$70,890 85		
Salaries and wages, appropriation		$75,000 00	$145,890 85
Support, balance July 1, 1916	$40,981 26		
Support, appropriation		$37,500 00	78,481 26
Total			$224,372 11
Disbursements—			
Salaries and wages	$70,850 04	$74,110 32	
Lapsed July 1, 1917	40 81		
Support	38,715 18	36,717 27	
Lapsed July 1, 1917	2,266 08		222,699 70
Balance in treasury July 1, 1918			$1,672 41
Contingent fund—			
Balance on hand July 1, 1916	$1,449 12		
Receipts	7,323 64	$7,942 08	$16,714 84
Disbursements	7,345 77	5,722 39	13,068 16
Total			$3,646 68
Valuation of Property.			
Land, 130 acres	$650,000 00	$650,000 00	
Buildings	554,976 80	542,722 81	
Water	27,000 00	28,033 63	
Equipment	90,918 38	80,288 55	
Totals	$1,322,895 18	$1,301,044 99	
Gifts and Bequests.			
Loans	$65,300 00	$65,300 00	
Cash	4,426 23	4,426 23	
Totals	$1,392,621 41	$1,370,771 22	
Recapitulation.			
1. Number of teachers employed	40	40	
2. Number of students enrolled	287	274	
3. Receipts	$120,644 87	$120,442 08	
4. Expenditures	116,910 99	116,549 98	
5. Total valuation	1,392,621 41	1,370,771 22	
6. Number of Braille books	1,500	2,000	
7. Number of ink books	4,800	5,300	
8. Number of graduates	25	12	

Section 10.

UNIVERSITY OF CALIFORNIA.

TABLE NO. 28. Showing Professors Employed, Students Enrolled by Colleges and in Summer Sessions, Receipts and Expenditures, and Valuation of Property.

TABLE No. 28.

Statistics of University of California, Showing Number of Professors, Teachers and Students, 1916-17, 1917-18.

By JAMES SUTTON, Recorder of the Faculties.

Number of professors, lecturers and instructors in the University of California:

1916-1917		1917-1918	
Men	407	Men	436
Women	22	Women	31
Total	429	Total	467

Enrollment of Students.

Number of students enrolled in the—	1916-17				1917-18			
	Graduate students	Undergraduate students	Unclassified	Total	Graduate students	Undergraduate students	Unclassified	Total
College of Letters and Science:								
Men	316	1,477	------		234	1,080	------	
Women	525	2,358	------		509	2,590	------	
Totals	841	3,835	------	4,676	743	3,670	------	4,413
Colleges of Engineering and Chemistry:								
Men	45	753	------		25	596	------	
Women	5	6	------		3	6	------	
Totals	50	759	------	809	28	602	------	630
College of Commerce:								
Men	6	363	------		8	273	------	
Women	1	27	------		3	87	------	
Totals	7	390	------	397	11	360	------	371
College of Agriculture:								
Men	45	532	------		22	333	------	
Women	17	14	------		3	25	------	
Totals	62	546	------	608	25	358	------	383
School of Jurisprudence:								
Men	84	83	------		38	42	------	
Women	7	6	------		9	7	------	
Totals	91	89	------	180	47	49	------	96
Medical School:								
In Berkeley—								
Men	30	39	------		48	65	------	
Women	3	1	------		3	3	------	
Totals	33	40	------	73	51	68	------	119
In San Francisco—								
Men	28	15	------		27	2	------	
Women	7	3	------		9	3	------	
Totals	35	18	------	53	36	5	------	41
In Los Angeles—								
Men	------	------	46		------	------	39	
Women	------	------	2		------	------	3	
Totals	------	------	48	48	------	------	42	42
School of Architecture:								
Men	6	------	------		2	------	------	
Women	2	------	------		------	------	------	
Totals	8	------	------	8	2	------	------	2

Enrollment of Students—Continued.

Number of students enrolled in the—	1916-17				1917-18			
	Graduate students	Undergraduate students	Unclassified	Total	Graduate students	Undergraduate students	Unclassified	Total
College of Dentistry:								
Men	-------	-------	170		7	152	-------	
Women	-------	-------	5		-------	7	-------	
Totals	-------	-------	175	175	7	159	-------	166
College of Pharmacy:								
Men	-------	-------	89		-------	-------	82	
Women	-------	-------	3		-------	-------	5	
Totals	-------	-------	92	92	-------	-------	87	87
Hastings College of the Law:								
Men	21	70	-------		5	32	-------	
Women	4	4	-------		1	3	-------	
Totals	25	74	-------	99	6	35	-------	41
Grand totals	-------	-------	-------	7,218	-------	-------	-------	6,391

Summer Sessions.

	1916	1917
Men	1,190	868
Women	2,785	3,111
Totals	3,975	3,979
Total number of students, deducting duplicates*	10,323	9,573

*Summer session students also registered in the fall session next ensuing and graduates who received their degrees as undergradutes, in December.

Graduated During the Year.

	1916-17	1917-18
Men	612	433
Women	359	509
Totals	971	942

Total number of degrees conferred since establishment of the university, 16,219.

Summary of Additional Enrollment.

(See note.)

	Students	
	1916-17	1917-18
Lick-Wilmerding Trade School	483	449
Agricultural Extension (correspondence courses)	29,622	34,416
University Extension	3,329	6,901
Correspondence courses	5,745	2,456
Farm School, Davis	314	218
California School of Fine Arts	356	507
Totals	39,549	44,947

NOTE.—Instruction in the departments herein referred to does not, generally speaking, lead to University degrees.

UNIVERSITY OF CALIFORNIA, FINANCIAL STATEMENT.

Summary of Income, Year Ending June 30, 1917.

By ROBERT G. SPROUL, Acting Controller.

From investments	$260,394 69	
United States	110,235 33	
State of California	3,106,673 28	
		$3,477,303 30
Student fees	$240,228 76	
Dental department	29,507 20	
Medical department	22,312 72	
Clinics of hospital and infirmary	80,707 47	
		372,756 15
Sale of agricultural and other produce		204,719 41
Miscellaneops receipts		30,953 42
Gifts for current use	$78,841 27	
Gifts for addition to funds	123,805 64	
Buildings and improvements	31,675 39	
		234,322 30
		$4,320,054 58

Expenditures, July 1, 1916, to June 30, 1917.

Administration and operation	$419,812 16
Buildings and improvements	1,869,331 01
Education and research	1,998,496 57
Research and other expenses in connection with the War Department	9,622 47
Disbursements from class funds, scholarships, fellowships and prizes	48,237 57
Departmental sales expenditures	215,759 90
Interest paid to endowments income	5,555 41
	$4,566,815 09

Assets.

Real estate in Berkeley	$1,545,822 44	
Buildings and improvements in Berkeley	5,375,686 04	
Real estate and improvements not in Berkeley	3,981,355 10	
		$10,902,853 58
Equipment		2,772,905 31
Investments, bonds, stocks, notes		4,932,116 97
Cash, amounts receivable, etc.		952,838 17
		$19,560,724 03

Summary of Income, Year Ending June 30, 1918.*

From investments	$285,304 15	
United States	119,433 21	
State of California	2,225,619 02	
		$2,630,356 38
Student fees	$200,864 30	
Dental department	27,644 13	
Medical department	25,165 71	
Clinics of hospital and infirmary	154,982 77	
		408,656 91
Sale of agricultural and other produce		218,265 96
Miscellaneous receipts		32,642 20
Gifts for current use	$86,827 64	
Gifts for addition to funds	120,625 77	
Gifts for buildings and improvements	35,000 00	
Income for war work (all sources)	248,710 49	
		491,163 90
		$3,781,085 35

Expenditures, July 1, 1917, to June 30, 1918.*

Administration and operation	$466,340 39
Buildings and improvements	550,991 94
Education and research	2,213,606 21
Research and other expenses in connection with war work	322,416 83
Disbursements from class funds, scholarsnips, fellowships and prizes	40,974 04
Departmental sales expenditures	280,700 99
Interest paid to endowments income	10,395 00
	$3,885,425 40

Assets.

Real estate in Berkeley	$1,548,297 44	
Buildings and improvements in Berkeley	5,709,234 82	
Real estate and improvements not in Berkeley	4,146,484 91	
		$11,404,017 17
Equipment	$2,948,039 10	
Investments, bonds, stocks, notes	5,347,787 74	
Cash, amounts receivable, etc.	1,037,420 31	
		9,333,247 15
		$20,737,264 32

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*Estimated, as books are not audited yet. Report very correct.

Section 11.

STATISTICAL SUMMARY.

Table No. 29. Showing Statistical Summary of all Public Schools and Educational Institutions in the State of California.

TABLE No. 29.

Statistical Summary of 1916-17 and 1917-18.

(Kindergarten, Elementary, High and Normal Schools, Institution for the Deaf and the Blind, California Polytechnic School and the University of California.)

(1) Kindergarten Schools.

	1916-1917	1917-1918
Number of counties maintaining	30	34
Number of teachers employed (women)	599	672
Grade of certificates held by teachers—		
Kindergarten, primary	571	621
Kindergarten (special)	28	51
Totals	599	672
Average salary paid teachers—		
Supervisors (3 in state)	$1,241 67	
Principals (225 in state)	933 29	
Regular teachers (371 in state)	799 33	
Supervisors (6 in state)		$1,439 66
Principals (280 in state)		905 69
Regular teachers (386 in state)		789 30
Number of pupils enrolled—		
Boys	11,509	13,751
Girls	12,051	14,099
Totals	23,560	27,350
Average daily attendance	12,828	14,311
Average number of days school was open for year	175	173
Number of school visits made by—		
County superintendents	550	650
School trustees	630	596
Number of books in libraries	3,284	3,846

Financial Statement.

	1916-1917	1917-1918
Receipts from—		
Balance on hand	$149,946 15	$104,402 36
Taxes for maintenance	733,949 57	795,298 28
Special tax for buildings	3,963 19	
Donations, etc.	1,056 80	2,526 55
Totals	$888,915 71	$902,227 19
Expenditures for—		
Salaries of teachers	$567,374 76	$567,791 19
Current expense	186,853 33	187,522 21
Sites, buildings, and furniture	27,405 83	26,657 58
Library books	142 52	515 05
Apparatus	3,069 42	1,412 60
Totals	$784,845 86	$783,898 63
Balance unexpended	$104,069 85	$118,328 56
Average tax rate for—		
Maintenance	$0.0706	$0.0703
Buildings	.075	
Average cost per pupil enrolled per year (salaries and supplies)	$33 18	$27 68
Average cost per pupil in average daily attendance for all expenses excepting buildings	59 04	52 91
Number of schoolhouses built of—		
Concrete	2	3
Brick	6	7
Wood	49	57
Totals	57	67

Note.—Many of the kindergarten schools are held in the elementary buildings. Hence a variation in the report on buildings and valuation of property.

	1916-1917	1917-1918
Valuation of property—		
Sites, buildings, and furniture*	$155,770 00	$156,571 00
Library books	4,402 00	4,196 00
Apparatus	10,497 00	43,790 00
Totals	$170,669 00	$204,557 00

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*Furniture and equipment are reported in apparatus.

(2) Elementary (Primary and Grammar, Including Evening and Day and Deaf) Schools.

	1916-1917	1917-1918
Number of school districts—		
Active at beginning of year	3,481	3,495
Newly organized	52	31
Suspended, re-established	28	14
Lapsed	14	5
Suspended during year	27	38
Combined	8	24
Total active at close of year	3,512	3,473
Number of union school districts	28	33
Number districts that are joint	64	66
Number of districts maintaining school—		
Less than 120 days	12	35
Between 120 and 160 days	884	1,289
Between 160 and 200 days	2,434	2,093
Over 200 days	145	36
Number of teachers, estimated on average daily attendance (for apportionment of money)	12,209	12,303
Number of teachers employed—		
Men	1,215	1,112
Women	12,516	13,137
Totals	13,731	14,249
Grade of certificate held by teachers in elementary schools—		
High school	531	544
Elementary	12,398	12,867
Primary	66	70
Special	736	768
Totals	13,731	14,249
Enrollment of pupils:*		
First year—		
Boys	46,443	47,720
Girls	39,745	41,811
Second year—		
Boys	30,214	30,250
Girls	26,819	26,934
Third year—		
Boys	29,090	29,968
Girls	27,080	27,965
Fourth year—		
Boys	28,250	28,799
Girls	26,206	27,203
Fifth year—		
Boys	26,142	27,281
Girls	23,934	25,211
Sixth year—		
Boys	24,946	24,596
Girls	22,076	23,309
Seventh year—		
Boys	19,778	22,576
Girls	19,612	21,330
Eighth year—		
Boys	18,948	20,816
Girls	19,098	22,461
Total boys	223,811	232,006
Total girls	204,570	216,224
Grand total	428,381	448,230

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*In some counties books are taken over by county library and not reported.

	1916-1917	1917-1918
Number of pupils enrolled in postgraduate grammar schools:		
First year—		
Boys	136	87
Girls	224	125
Second year—		
Boys	35	15
Girls	69	38
Total boys	171	102
Total girls	293	153
Grand total	464	255
Number of graduates from grammar schools—		
Boys	13,715	13,696
Girls	15,324	15,555
Totals	29,039	29,251
Number of graduates from postgraduate schools—		
Boys	17	6
Girls	35	16
Totals	52	22
Average daily attendance	348,304	350,568
Average number of days school was actually open	166	164
Number of visits made by—		
County superintendents	20,565	19,296
School trustees and members of boards of education	19,570	19,365
Number of books in school libraries	2,763,909	3,028,054
Number of books in county teachers' libraries in office of county superintendent	77,610	76,808

Financial Statement.

	1916-1917	1917-1918
Receipts from—		
Balance on hand	$4,858,669 28	$3,592,181 15
State apportionment	*5,776,957 30	*5,913,116 02
County apportionment	7,279,062 74	7,035,578 75
Special tax for maintenance	4,840,882 07	4,904,191 13
Special tax for buildings	†	825,235 38
Sale of bonds for buildings	1,677,215 30	693,630 86
Miscellaneous sources	593,669 75	1,062,757 85
Total resources for year	$25,026,456 44	$24,026,691 14
Expenditures for—		
Salaries of teachers	$13,469,080 23	$13,484,445 77
Salaries of janitors, gardeners, etc.	------------	1,388,001 85
Regular supplies, fuel, paper, pens, etc.	‡4,089,053 20	2,303,997 57
Sites, buildings, repairs, furniture	3,487,293 23	3,178,259 19
Library books	174,186 39	190,664 90
Apparatus and equipment	39,356 67	67,441 00
Transportation of pupils	------------	52,328 78
Total expenditures for all purposes	$21,258,969 72	$20,665,139 06
Balance on hand at close of year	$3,767,486 72	$3,361,552 08
Average tax for county school purposes	$0.2875	$0.295
Average special tax rate for—		
Maintenance	.1805	.205
Buildings	.3896	.206
Valuation of property—		
Sites and buildings	$59,609,171 00	$55,350,169 00
School libraries	1,435,810 00	1,090,964 00
Furniture, apparatus, and equipment	§789,796 00	3,742,686 00
Total valuation	$61,434,777 00	$60,183,819 00
Total amount of outstanding bonds	$25,986,948 00	$24,788,796 00

---

*As apportioned to districts by superintendent.

†Included in maintenance.

‡Includes janitor, etc., and transportation of pupils.

§Furniture and equipment included in buildings for 1917.

	1916-1917	1917-1918
Average rate of interest paid on bonds issued	$0.0656	$0.056
Cost per pupil enrolled per annum for education, excluding cost of new buildings	$41 44	$39 05
Cost per pupil on average daily attendance for all cost of high schools	51 02	49 88
Average rate per pupil apportioned on average daily attendance by counties, which includes state and county money after giving the $550 per teacher	16 97	18 78

Average annual salary paid teachers:

	1916-1917		1917-1918	
	Number	Amount	Number	Amount
District superintendents—				
Men	182	$2,041 89	190	$2,035 80
Women	164	1,960 70	175	1,943 79
Principals—				
Men	455	1,192 12	439	1,236 40
Women	172	976 84	900	970 98
Regular teachers—				
Men	354	855 00	239	905 00
Women	11,002	887 63	11,441	895 90
Special:				
Supervisors of subjects—				
Men	47	1,737 27	54	1,673 61
Women	127	1,399 88	116	1,625 88
Teachers of subjects—				
Men	175	1,098 84	189	1,105 16
Women	453	988 87	506	987 28

Number of schoolhouses built of—	1916-1917	1917-1918
Steel, concrete, or stone	------------	16
Stone	20	24
Concrete	190	233
Brick	397	403
Wood	4,345	4,369
Totals	4,952	5,045

(3) High Schools.

Number and kind of school—		
County	7	6
City	69	74
District	47	45
Union	168	168
Joint union	18	18
Totals	309	311
Number, sex, and position of teachers:		
Regular—		
Men	1,224	1,173
Women	1,841	2,028
Special—		
Men	611	689
Women	778	914
Teachers in junior colleges exclusively:		
Regular—		
Men	------------	2
Women	------------	5
Special—		
Men	------------	------------
Women	------------	------------
Total men	1,835	1,864
Total women	2,619	2,947
Grand total	4,454	4,811

Number and grade of certificate held by teachers:	1916-1917	1917-1918
Regular high school	2,995	3,209
Special high school	1,459	1,602
Totals	4,454	4,811
Total number of pupils enrolled by year and by sex:		
In regular high schools—		
First year—		
Boys	29,409	26,444
Girls	32,599	31,800
Second year—		
Boys	10,704	10,143
Girls	11,589	14,440
Third year—		
Boys	6,365	6,889
Girls	8,104	9,404
Fourth year—		
Boys	6,024	5,320
Girls	7,890	7,943
Total boys	52,502	49,396
Total girls	60,182	63,587
Grand total	112,684	112,983
In special day and evening classes*—		
First year—		
Boys		3,948
Girls		7,545
Second year—		
Boys		152
Girls		150
Third year—		
Boys		57
Girls		67
Fourth year—		
Boys		34
Girls		260
Total boys		4,191
Total girls		8,022
Grand total		12,213
In junior college—		
First year—		
Boys		451
Girls		871
Second year—		
Boys		67
Girls		172
Total boys		518
Total girls		1,043
Grand total		1,561

---

*First year law in effect.

	1916-1917	1917-1918
Total enrollment in all high schools and classes:		
First year—		
Boys	29,409	30,845
Girls	32,599	40,216
Second year—		
Boys	10,704	10,962
Girls	11,589	14,762
Third year—		
Boys	6,365	6,946
Girls	8,104	9,471
Fourth year—		
Boys	6,024	5,354
Girls	7,890	8,203
Total boys	52,502	54,107
Total girls	60,182	72,152
Grand total	112,684	126,759
Total enrollment in postgraduate high schools:		
First year—		
Boys	577	32
Girls	791	108
Second year—		
Boys	107	4
Girls	139	12
Total boys	684	36
Total girls	930	120
Grand total	*1,614	*156
Average daily attendance in high school	62,865	64,671
Average daily attendance post graduate high school	859	87
Total average daily attendance	63,724	64,758
Average number of days school was actually open	189	178
Number of volumes in libraries	460,751	521,496

Financial Statement.

	1916-1917	1917-1918
Receipts from—		
Balance on hand	$3,319,558 47	$2,780,993 32
State apportionment	884,171 87	944,020 13
County apportionment	3,918,598 68	3,911,872 16
Special taxes for maintenance	4,243,546 37	4,933,577 32
Special taxes for buildings	61,747 22	60,657 94
Sale of bonds for buildings	1,135,713 14	543,796 85
Miscellaneous sources	428,286 06	672,696 72
Total receipts	$13,991,621 81	$13,847,614 44
Expenditures for—		
Salaries of teachers	$6,560,743 82	$6,796,729 16
Salaries of janitors, gardeners, etc.	748,136 64	784,871 34
Regular supplies, fuel, paper, pens, etc.	1,345,303 96	1,183,509 70
Sites, buildings, repairs, furniture	2,230,442 08	2,053,903 69
Library books	202,557 57	89,577 07
Apparatus and equipment	-------------	191,598 52
Laboratory supplies	119,731 63	111,680 55
Transportation of pupils	-------------	220,458 32
Total expenditures	$11,206,915 70	$11,432,328 35
Balance on hand at close of year	$2,784,706 11	$2,415,286 09
Average cost per pupil enrolled for all cost of high schools, excepting that for buildings	$78 54	$73 82
Average cost per pupil on average daily attendance for all cost of high schools	140 85	144 82

---

*Most post graduate pupils have attended junior college.

Average tax rate for—	1916-1917	1917-1918
County, for maintenance	$0.144	$0.144
District tax for maintenance	.2281	.269
District tax for buildings	.1203	.168
Rate of interest paid on bonds issued	.0523	.0504
Total outstanding bonds	$12,710,000 00	$14,346,010 00
Valuation of all property—		
Sites and buildings	$26,468,807 00	$25,977,833 00
Laboratories, furniture and equipment	824,172 00	3,131,213 00
Library books	804,364 00	594,397 00
Total valuation	$28,097,343 00	$29,703 443 00

Average salary paid teachers:	1916-1917		1917-1918	
Principals—	Number	Amount	Number	Amount
Men	285	$2,084 21	285	$2,306 63
Women	10	1,812 50	11	2,019 66
Regular teachers—				
Men	950	1,538 90	886	1,450 64
Women	1,834	1,380 01	1,996	1,336 95
Special teachers—				
Men	600	1,270 16	701	1,249 74
Women	775	1,252 09	932	1,196 01

	1916-1917	1917-1918
Number of schoolhouses built of steel, concrete or stone	----	27
Stone	31	9
Concrete	101	104
Brick	172	170
Wood	131	153
Totals	435	463

(4) Miscellaneous School Statistics.

*Number of schoolhouses built of—		
Steel and concrete, or stone	--	43
Stone	51	33
Concrete	293	340
Brick	575	580
Wood	4,525	4,579
Totals	5,444	5,575
Number of teachers attending institute from—		
High schools	4,262	4,680
Elementary schools	13,409	13.941
Kindergartens	581	661
Totals	18.252	19,282
Cost of teachers' institutes—		
Paid instructors	$15.691 61	$15.997 72
Paid for expenses	3,785 61	5,187 23
Totals	$19,477 22	$21,184 95
Cost of trustees' meetings—		
Paid lecturers	$824 55	$1,012 93
Paid for expenses	1,694 38	1,797 76
Totals	$2,518 93	$2,810 69

NOTE.—The law intends that the expense of lecturers and hall rent should be paid from the unapportioned county school fund; that the expenses of representatives from the boards of school trustees and boards of education, should be paid from the current expense fund of the school district. But in some instances, the county superintendents seem to have paid the expenses of representatives from the unapportioned county funds. This makes the item of expenses shown here larger than it should be.

*Includes kindergarten, elementary and high.

	1916-1917	1917-1918
Number of certificates issued by county boards of education during the year:		
On examination, to—		
Men	30	9
Women	199	149
On credentials, to—		
Men	697	730
Women	4,432	4,172
Amount of fees collected for examination and issuance and renewal of certificates	$14,082 00	$11,300 00
Number of teachers in kindergarten, elementary and high schools	18,784	19,732
Number of pupils enrolled in kindergarten, elementary and high schools	566,943	602,750
Total average daily attendance in kindergarten, elementary and high schools	424,856	429,637
Miscellaneous county expenses—		
Total cost of county superintendents and deputies	$202,851 17	$213,014 03
Traveling expenses of such officers	19,201 98	22,897 94
Postage and expressage	7,314 15	7,726 62
Other expenses—office supplies, etc.	12,331 04	20,916 82
Total, miscellaneous expenses	$241,698 34	$264,555 41
Total cost of salaries of members of county boards of education	$50,122 62	$85,036 00
Traveling expenses of members	6,870 86	7,964 79
Other office expenses	5,508 10	15,769 72
Totals	$62,501 58	$108,770 51
Total cost of city superintendents for salaries and for salaries of deputies	$330,776 12	$268,234 85
Traveling expenses	2,573 47	6,450 39
Office expenses, supplies, etc.	5,007 45	26,887 66
Totals	$338,350 04	$301,572 90

(5) State Normal Schools.

	1916-1917	1917-1918
Number of schools	8	8
Number of teachers employed:		
Men	81	84
Women	242	231
Totals	323	315
Number of students enrolled:		
Normal department—		
Boys	358	204
Girls	5,011	4,118
Totals	5,369	4,322
Number of pupils enrolled:		
Training schools—		
Boys	1,680	1,698
Girls	1,684	1,758
Totals	3,364	3,456
Number of graduates for year:		
Boys	110	99
Girls	1,678	1,862
Totals	1,788	1,961
Grand total since organization:		
Boys	------------	1,399
Girls	------------	19,460
Totals	------------	20,859

Financial Statement.

Receipts from—	1916-1917	1917-1918
Balance on hand	$269,638 28	$43,233 38
State appropriations	649,114 95	1,201,171 53
Tuition and other sources	1,837 50	834 50
Miscellaneous sources	30,367 43	11,459 78
Totals	$950,958 21	$1,256,699 19
Expenditures for—		
Salary of teachers	$510,443 41	$525,440 06
Janitors, labor and supplies	196,001 74	159,451 12
Sites, buildings, and furniture	172,670 64	48,471 52
Books and apparatus	9,459 03	6,773 18
Totals	$882,297 82	$740,135 88
Balance on hand in funds of schools	$68,660 39	$516,563 31
Valuation of property—		
Grounds	$524,600 00	$516,900 00
Buildings	2,099,166 00	2,107,082 00
Furniture	251,452 00	252,084 00
Books	117,091 00	120,488 00
Apparatus	60,211 00	61,388 00
Supplies on hand	16,473 00	8,388 00
Totals	$3,068,993 00	$3,066,280 00
Number of acres in normal grounds	162.53	162.53
Number of books in libraries—		
At beginning of year	105,546	113,259
Bought	13,806	11,686
Donated	758	459
Lost or destroyed	—5,081	—881
Total at close of year	115,029	124,523

(6) Recapitulation.

Number of elementary school districts	3,512	3,453
Number of high schools	309	311
Number of teachers employed in all schools—		
Kindergartens	599	672
Elementary schools	13,731	14,249
High schools	4,454	4,811
Normal schools	323	315
California Polytechnic	21	18
Institution for the Deaf and the Blind	40	40
University of California	429	467
Totals	19,597	20,572
Students enrolled in all schools—		
Kindergartens	23,560	14,249
Elementary schools	432,038	451,848
High schools	114,298	126,915
Normal schools—normal training	5,369	4,322
California Polytechnic	156	303
Institution for the Deaf and the Blind	287	274
University of California	7,218	6,391
Totals	582,926	604,302
Receipts—		
Kindergartens	$888,915 71	$902,327 19
Elementary schools	25,026,456 44	24,026,691 14
High schools	13,991,621 81	13,847,614 44
Normal schools	950,958 21	1,256,699 19
California Polytechnic	79,467 89	81,576 25
Institution for the Deaf and the Blind	120,644 87	120,442 08
University of California	4,320,054 58	3,791,085 35
Totals	$45,378,119 51	$44,026,435 64

Expenditures—	1916-1917	1917-1918
Kindergartens	$784,845 86	$783,898 63
Elementary schools	21,258,969 72	20,665,139 06
High schools	11,206,915 70	11,432,328 35
Normal schools	882,390 87	740,135 88
California Polytechnic	77,907 47	75,769 88
Institution for the Deaf and the Blind	116,910 09	116,549 98
University of California	4,566,815 09	3,885,425 40
Totals	$38,894,754 80	$37,699,247 18
Valuation of property—		
Kindergartens	$170,669 00	$204,557 00
Elementary schools	61,434,777 00	60,183,819 00
High schools	28,097,343 00	29,703,443 00
Normal schools	3,068,993 00	3,066,280 00
California Polytechnic	391,256 00	448,883 00
Institution for the Deaf and the Blind	1,392,621 00	1,370,771 00
University of California	19,560,724 00	20,737,264 00
Totals	$114,116,383 00	$115,715,017 00
Number of books school libraries—		
Kindergartens	3,284	3,846
Elementary schools	2,763,909	3,028,054
High schools	460,751	521,496
Normal schools	115,029	124,523
California Polytechnic	3,143	3,350
Institution for the Deaf and the Blind	6,325	7,312
University of California	*	381,000
Library, county superintendent's office	77,610	76,808
Totals	4,430,051	4,146,389

NOTE.—County libraries have taken over many books not reported.

Number of graduates—		
Elementary schools	29,039	29,251
High schools	9,510	9,848
Normal schools	1,788	1,961
California Polytechnic	12	4
Institution for the Deaf and the Blind	25	12
University of California	971	942
Totals	41,345	42,018
Total outstanding bonded debt—		
Elementary schools	$25,986,948 00	$24,788,796 00
High schools	12,710,000 00	14,346,010 00
Totals	$38,696,948 00	$39,134,806 00

Total Expenditures for All School Purposes.

Kindergartens	$784,845 86	$783,898 63
Elementary schools	21,258,969 72	20,665,139 06
High schools	11,206,915 70	11,432,328 35
Totals	$33,250,731 28	$32,881,366 04
Overhead expenses—		
Office of county superintendent of schools	$241,698 34	$264,555 41
Expense of county board of education	62,501 58	108,770 51
Expense of city offices	338,357 04	301,572 90
Total	$642,556 96	$674,898 82
Office of superintendent of public instruction	$33,249 50	$30,707 62
Total cost of state board of education	41,288 31	86,821 72
Entire cost of textbooks, manufacture, royalty, cost of shipment, etc.	126,219 27	120,101 48
Totals	$200,757 08	$237,630 82

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*Not reported.

	1916-1917	1917-1918
State normal schools	$882,297 82	$740,135 88
California Polytechnic School	77,907 47	75,769 88
Institution for the Deaf and the Blind	116,910 99	116,549 98
University of California	4,566,815 09	3,885,425 40
Totals	$5,643,931 37	$4,817,881 14

Grand Total Expenditures.

Kindergarten, elementary and high schools	$33,250,731 28	$32,881,366 04
Offices of County Superintendent, county boards of education and city boards of education	642,556 96	674,898 82
Offices of Superintendent of Public Instruction, State Board of Education, and entire cost of textbooks	200,757 08	237,630 82
State institutions (normal schools, California Polytechnic School, Institution for the Deaf and the Blind, and University of California)	5,643,931 37	4,817,881 14
Grand totals	$39,737,976 69	$38,611,776 82

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BIENNIAL REPORT

OF THE

STATE TREASURER

STATE OF CALIFORNIA

FOR THE SIXTY-EIGHTH AND SIXTY-NINTH FISCAL YEARS

JULY 1, 1916 TO JUNE 30, 1918

FRIEND WM. RICHARDSON,
State Treasurer

CALIFORNIA STATE PRINTING OFFICE
SACRAMENTO
1918

39678

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STATE TREASURERS OF THE STATE OF CALIFORNIA.

FRIEND WM. RICHARDSON	January 4, 1915, to ————
E. D. ROBERTS	February 20, 1911, to January 4, 1915
W. R. WILLIAMS	January 7, 1907, to February 20, 1911
TRUMAN REEVES	January 2, 1899, to January 7, 1907
W. S. GREEN	April 21, 1898, to January 2, 1899
LEVI RACKLIFFE	January 7, 1895, to April 21, 1898
J. R. McDONALD	January 5, 1891, to January 7, 1895
ADAM HEROLD	January 3, 1887, to January 5, 1891
D. J. OULLAHAN	December 24, 1884, to January 3, 1887
WM. A. JANUARY	January 1, 1883, to December 24, 1884
JOHN WEIL	January 5, 1880, to January 1, 1883
JOSE G. ESTUDILLO	December 4, 1875, to January 5, 1880
FERDINAND BAEHR	December 2, 1871, to December 4, 1875
A. F. CORONEL	December 7, 1867, to December 2, 1871
ROMUALDO PACHECO	October 10, 1863, to December 7, 1867
R. R. ASHLEY	January 6, 1862, to October 10, 1863
THOMAS FINDLEY	January 4, 1858, to January 6, 1862
JAMES L. ENGLISH	February 13, 1857, to January 4, 1858
HENRY BATES	January 7, 1856, to February 13, 1857
S. A. McMEANS	January 2, 1854, to January 7, 1856
RICHARD ROMAN	December 22, 1849, to January 2, 1854

STATE TREASURER'S OFFICE.

FRIEND WM. RICHARDSON,
STATE TREASURER.

JOHN F. JOHNSON, Deputy.	H. P. REESE, Cashier.
E. M. LYNCH, Bond Officer.	W. A. MCELVAINE, Deposit Officer.
E. B. WILKERSON, Bookkeeper.	LOUISE B. BOOTES, Secretary-Stenographer.
PAUL BROWN, Watchman.	WARREN WEAVER, Watchman.
M. F. ROWLAND, Watchman.	W. B. THORPE, Watchman.

GEORGE M. FRANCIS,
Porter.

BIENNIAL REPORT OF THE STATE TREASURER.

Sixty-eighth and Sixty-ninth Fiscal Years,
July 1, 1916—June 30, 1918.

SACRAMENTO, CALIFORNIA,
September 15, 1918.

To His Excellency,
WM. D. STEPHENS,
Governor of California.

SIR: I have the honor to submit herewith a report showing the exact balance in the treasury to the credit of the state, with a summary of the receipts and payments of the treasury during the two preceding fiscal years. This report covers the business of this office in every particular for the sixty-eighth and sixty-ninth fiscal years, comprising the period commencing July 1, 1916, and ending June 30, 1918. The great volume of business transacted by this office is shown by the receipts which total $76,734,026.26 for the biennial period, and exceed the preceding period by $9,001,807.94, and also exceed the sixty-fourth and sixty-fifth fiscal years by $15,786,149.54. This shows an increase of business in this office in four years of 26 per cent.

The expenditures show a total for the sixty-eighth and sixty-ninth fiscal years of $76,820,034.48, an increase of $4,849,812.87 over the previous biennial report, and an increase of $25,181,860.35 over the sixty-fourth and sixty-fifth fiscal years. These are gross figures and include bond sales and other items.

Fiscal years	Receipts	Expenditures
Sixty-fourth and sixty-fifth	$60,947,876 68	$51,638,174 13
Sixty-sixth and sixty-seventh	67,732,218 32	71,970,221 61
Sixty-eighth and sixty-ninth	76,734,026 26	76,820,034 48

This large amount of business has been done with a very small office force and exceeds with few exceptions the total business of any bank in the state. There has been no increase in the number of employees, although the business has increased one-fourth.

The aggregate business is best shown by a summarized statement of the gross receipts and disbursements for the past two fiscal years.

Receipts.

Corporation license and fees	$1,826,982	28
Normal schools, homes, reformatories, hospitals	877,574	33
Prisons and industries connected therewith	1,317,387	81
County treasurers' settlements and teachers' pensions	10,420,747	59
Fish and Game Commission	742,039	93
Bond sales and premiums	7,098,775	00
Compensation Insurance and Industrial Accident Commission	3,128,915	27
San Francisco Harbor Commission	4,321,126	40
School fund, interest and redemption of bonds	845,518	83
School land fund, interest and maturity of bonds	783,513	03
Motor vehicle	6,996,714	85
Corporation franchise tax	32,028,848	28
Interest on state deposits	545,062	83
Other sources (see statement)	5,800,819	83
Total	$76,734,026	26

Disbursements.

Compensation insurance fund	$3,048,678	25
Fish and game preservation fund	639,156	07
General fund	25,823,640	70
Highway fund	1,939,320	37
Highway interest and sinking fund	1,824,000	00
Second highway fund	4,617,758	64
Second highway interest and sinking fund	225,112	50
Motor vehicle fund	5,686,716	44
San Francisco harbor improvement fund	2,926,266	11
School fund	11,674,686	61
High school fund	1,828,452	90
Normal schools, homes, hospitals, reformatories	917,187	63
Prisons and industries connected therewith	1,075,162	57
San Francisco seawall sinking fund	321,420	00
Second San Francisco seawall fund	615,364	10
Second San Francisco seawall sinking fund	720,000	00
Third San Francisco seawall fund	1,361,646	22
Third San Francisco seawall sinking fund	64,000	00
India Basin fund	611,431	80
India Basin sinking fund	37,500	00
Interest and sinking fund	282,870	00
Library fund	217,469	55
Printing fund	682,037	04
School land fund	778,037	04
School teachers' permanent fund	476,472	81
School teachers' retirement salary fund	421,261	16
State university fund	2,210,488	23
University of California building fund	1,568,008	80
University of California building sinking fund	162,000	00
Support and maintenance Veterans Home	461,119	93
Sacramento and San Joaquin drainage districts funds	830,982	61
Miscellaneous funds (see statement)	2,771,786	40
Total	$76,820,034	48

These figures should be studied in conjunction with the report of the State Controller and the budget of the State Board of Control. The reports of the Tax Association of California on state affairs will be found instructive.

CORPORATION FRANCHISE DEPARTMENT.

This office collects corporation franchise taxes from more than fifteen thousand corporations semiannually, which makes an immense volume of work during the months of January, February, July and August. The amount collected during the past two years totals $32,028,848.28. This tax is levied by the State Board of Equalization under what is commonly called Constitutional Amendment No. 1, adopted by the people in 1910. While this tax is collected by this office, the books are kept and the receipts sent out by the State Controller. There is much confusion among taxpayers because the corporation license tax is collected by the Secretary of State. There is demand for the changing of the law to prevent this confusion.

Under a technical interpretation of the law, payment of this tax could be demanded in gold coin, but in order to accommodate taxpayers and assist the government in the conservation of gold, I have accepted payment in exchange.

PAYMENTS IN GOLD.

The entrance of the United States into the great world war made it necessary for the government to gather up the gold of the country. As State Treasurer I have co-operated by releasing several millions in gold for the Federal Reserve Bank. In collecting taxes I have accepted exchange, thus helping to conserve gold. Franchise tax collections aggregating over nine million dollars were made in January and February of 1918, without asking for a dollar in gold.

California has been on a gold basis during all its history. In order to conserve the supply of gold I obtained Federal Reserve notes and asked all persons who presented warrants to accept payment in such notes in lieu of gold. I found a patriotic willingness on the part of state employees and the people to accept these notes. This method has been in operation now for several months and has met with great favor. Many claim that currency is more convenient to handle and it is evident that the old system of gold payments will probably never again be adopted. This plan has made it possible to carry only a small cash balance in the state vault and thus reduce the risk.

In a letter to me, dated February 14, 1918, John Perrin, Chairman of the Federal Reserve Board, said:

> "I have taken occasion to write to the Secretary of the Treasury an expression of our appreciation of the patriotic service which you are rendering in your co-operation as State Treasurer to mobilize gold in the Federal Reserve Bank. It is of greatest importance that the reserves of the Federal Reserve Bank should be built up to the maximum in order that it may have strength requisite to meet the strains which grow out of war financing. Your clear perception of this important fact and the effective steps which you have taken to minimize the use of gold as currency both evidence your patriotism and reflect credit upon jour judgment."

IRRIGATION DISTRICT BONDS AS SECURITY.

Previous to my administration it had been the policy to refuse to accept irrigation district bonds as security for state deposits, although both the Constitution and the Political Code specifically permitted their acceptance. In only one instance were irrigation district bonds accepted previous to 1915. I made a thorough investigation of the irrigation districts of the state and a study of the situation, and became fully convinced that the bonds of certified districts were good, and that as a matter of business policy they should be accepted as security for state deposits. It was predicted that this action on my part would result in flooding the state with a mass of securities of doubtful value. The prediction has not come true.

The result of this action was to stabilize the financial affairs of the irrigation districts and to increase materially the market rate of irrigation district bonds. During the trying times of the war no bonds on the market have stood up better than those of irrigation districts. This policy has not only helped the districts established, but has helped in the formation of other districts, and has brought into cultivation more of the lands of the state. I have been assisted in this policy by yourself and by the State Controller as members of the deposit committee.

DEPOSITS IN BANKS.

Under the provisions of the Constitution and statutes, a large part of the money of the state is deposited in banks and draws interest. These deposits are protected by the solvency of the depositaries and by the bonds put up as collateral. State deposits are placed on a competitive basis, and money is deposited with the bank offering the highest rate of interest, the minimum rate being fixed by law at 2 per cent per annum. Upon taking office I found several million dollars drawing only 2 per cent. I have succeeded in increasing the rate of interest so that all deposits are now drawing from 2½ to 3½ per cent. This has materially increased the revenue of the state. This increase has been accomplished by a strict compliance with the spirit and the letter of the law. When it has been necessary to call upon depositors, those banks paying the lowest rate of interest have been called first. I have considered this method the only fair one, as the banks which have had the advantage of the lowest rate should pay first. It is also in compliance with the spirit of the law placing deposits upon a competitive basis. It is probable that within the next few months it will be necessary to call in all deposits at the lowest rate, 2½ per cent.

This increase in the rate of interest on state funds has been accomplished, notwithstanding the fact that state money has been in competition with the moneys of cities and of counties which is usually let out at the minimum rate, 2 per cent. I have attempted to keep deposits on a firm basis so that many banks feel justified in paying a higher rate on account of the stability of state deposits.

STATE DEPOSIT ACT.

The act permitting the deposit of state money in banks was adopted in 1905. Previous to that time all of the money of the state had been piled up in the treasury. The first deposit was made on July 9, 1907, and since then the number of depositors has gradually increased until the amount of money on deposit in the banks of the state runs into several million dollars. This policy has proved beneficial in keeping down the accumulation of money in the state vault, and of helping to ease the financial conditions in the state. All money deposited in banks is on call and presumed to be the same as cash in the vault.

The deposit act under which the state is operating is an antiquated one, and two attempts have been made to provide for an amendment. At the coming election an amendment will be considered by the voters to place the making of a new deposit act in the hands of the legislature. If the amendment carries it will be possible for the legislature to provide for two kinds of deposits: one, term deposits, and the other, active deposits. The term deposits should not be disturbed except in cases of great necessity, while the active deposits can be used as a checking account by the State Treasurer in the payment of claims. The need for active deposits is obvious. With active deposits there would be little cash in the vault and this would result in removing a hazard and in increasing the amount of interest collections. The fact that all of the banks, both state and national, are so carefully examined and rigidly managed reduces the chance of loss to the minimum.

STATE BONDS UNSOLD.

The following is a list of state bonds authorized by the people but not yet sold:

Sacramento State Building, 4 per cent	$3,000,000 00
India Basin, 4 per cent	310,000 00
San Francisco Harbor Improvement, 4 per cent	8,650,000 00
Second State Highway, 4½ per cent	9,980,000 00

GENERAL SUBJECTS.

The collection of an oil protection tax is another duty placed upon this office by the statutes, which has added to its labors. The collections for the two fiscal years amounted to $183,316.64.

The statement of the contingent fund of this office shows that all traveling expenses incurred by me in the transaction of state business, have been paid by me personally and without cost to the state.

All collections of bonds and interest coupons have been made without cost to the state, thus saving a considerable sum.

That such a great volume of work has been accomplished in this office with so small a force is due to the efficiency, energy and honesty of the employees of this department, each of whom deserves special commendation for co-operation to help maintain the standard of public service.

The Federal Reserve Bank has proved a wonderfully stabilizing influence, and the officers of that bank have been of help to me in many ways. Remittances to the fiscal agent of the state in New York have been made by the Federal Reserve Bank without cost.

There is, in my possession, $5,958.50 belonging to the Spanish-American War of 1898 account, which has not been drawn upon for the past two years. This money is held by me as a matter of convenience to you and the Adjutant General. Legislation should be enacted permitting this money to be paid into the treasury.

The National City Bank of New York was selected by you as fiscal agent for the state upon my recommendation. The law provides that all bonds when due, and interest upon bonds, may be paid by the fiscal agent.

BONDED INDEBTEDNESS.

The state of California has a bonded indebtedness which is small in comparison to the wealth of the state. The gross total on June 30, 1918, amounted to $39,363,500.

Of the funded debt bonds of 1873, $1,526,500 are held by the state for the benefit of the school fund, and $751,000 are held for the benefit of the university fund. Former treasurers have recommended the redemption of these bonds, as they are long past due. Some action should be taken to clear up this obligation, and I ask that this matter engage your serious attention. The credit of California should be preserved, and although the bonds are owned by the state school fund and the state university, still these bonds, due and unpaid, stand as a repudiation of a just debt. The seawall bonds of 1903, amounting to $675,000, and the issues of San Francisco harbor bonds of 1909, amounting to $9,000,000, and of 1913, amounting to $1,350,000, and the India Basin bonds, amounting to $690,000, are paid out of the revenues of San Francisco harbor. The state has loaned its credit to back these bonds. This leaves the only bonds which the state is directly obligated to pay: State highway bonds, $22,611,000; University of California building bonds, $1,800,000; and San Francisco state building bonds, $960,000. The $3,000,000 for the capitol extension at Sacramento have not been sold.

It will be seen from this that the net bonded debt of the state of California is at the present time $25,371,000, and of this amount the state bond investment fund owns $1,776,000. The payment of $23.595,000 would leave the state free from bonded indebtedness.

REGISTRATION OF BONDS.

In accordance with the statutes of 1913, there have been registered bonds to the total amount of $2,454,000 and the fees therefrom reported to the State Controller, and turned into the treasury as provided by law.

SALE OF STATE BONDS.

Bonds of the par value of $7,051,000 have been sold. The sales were for the purpose of getting money with which to complete roads under construction, to build new wharves and piers at San Francisco, and to purchase land under the India Basin Act.

The following is a list of bonds sold during the biennial period showing purchaser and price paid:

Date	Purchaser	Bonds	Amount	Premium
2/ 1/17	R. M. Grant and Torrance, Marshall & Co.	Harbor, Act 1913	$250,000 00	$11,937 50
2/ 3/17	R. M. Grant and Torrance, Marshall & Co.	Harbor, Act 1913	750,000 00	35,812 50
4/19/17	State of California	Indian Basin	625,000 00	
7/26/17	E. H. Rollins & Sons and National City Co.	Highway, Act 1915	3,000,000 00	
9/ 6/17	State of California	Highway, Act 1915	250,000 00	
9/ 7/17	National City Company	Highway, Act 1915	1,750,000 00	25 00
4/28/18	State of California	Harbor, Act 1913	200,000 00	
5/ 7/18	National Bank of D. O. Mills & Co.	Highway, Act 1915	5,000 00	
6/ 3/18	State of California	Harbor, Act 1913	150,000 00	
6/21/18	National Bank of D. O. Mills & Co.	Highway, Act 1915	6,000 00	
6/26/18	United Land Company	India Basin	65,000 00	
	Totals		$7,051,000 00	$47,775 00

The sale of February 1, 1917, of one million harbor bonds 4's, was the best sale ever made for a California state bond. Soon after war was declared and the interest rate went up.

UNIVERSITY OF CALIFORNIA BUILDING BONDS.

At the general election of November, 1914, a bond issue of $1,800,000 was authorized, the proceeds to be devoted to the construction of additional buildings at the state university at Berkeley. These bonds were all sold. The first forty of this issue will fall due in January, 1921, and the same number will become due each year thereafter until 1965.

SAN FRANCISCO STATE BUILDING BONDS.

At the general election in November, 1914, a bond issue of $1,000,000 was authorized, the proceeds of which were to be used in the construction and equipment of a state building at San Francisco. This issue has all been sold, and the first sixty have matured and been paid. Twenty of these bonds mature yearly.

SACRAMENTO STATE BUILDING BONDS.

At the general election in November, 1914, the issuance and sale of $3,000,000 of bonds was authorized, the proceeds of which were to be used in the construction of additional capitol buildings in Sacramento. These bonds have been prepared and printed, and are ready to be sold when necessary. All of these bonds are due fifty years after date, and $50,000 must be transferred each year from the general fund to a sinking fund and invested by the State Treasurer in bonds for the purpose of paying the principal.

STATE HIGHWAY BONDS.

Of the issue of $18,000,000 state highway bonds provided for by the statutes of 1909, the first $400,000 matured July 3, 1917, and were paid. Four hundred of these bonds mature yearly until all have been wholly redeemed. The state is reimbursed by the counties for interest payments.

SECOND STATE HIGHWAY BONDS.

At the election of November 7, 1916, there was authorized an additional $15,000,000 state highway bonds. These bonds were prepared and printed, and there have been sold up to June 30, 1918, $5,011,000. On July 3, 1923, these bonds will begin to mature at the rate of 375 annually until all have been wholly redeemed. The state is reimbursed by the counties for interest payments.

SAN FRANCISCO SEAWALL BONDS, ACT 1903.

These bonds were provided for under an act approved March 30, 1903, being an issue of $2,000,000. Statutory provision was made whereby these bonds would be matured by lot, on drawing, between the first and tenth day of November. On June 30, 1918, the outstanding bonds of this issue were $675,000.

SAN FRANCISCO HARBOR IMPROVEMENT BONDS, ACT 1909.

An issue of $9,000,000 of these bonds were provided for under the statutes of 1909. This issue has been sold and the interest is being paid out of the revenues of the San Francisco Harbor.

SAN FRANCISCO HARBOR IMPROVEMENT BONDS, ACT 1913.

At the general election held in November, 1914, a bond issue of $10,000,000 was authorized for the erection of wharves, piers, seawall and other betterments for the San Francisco Harbor. Bonds to the amount of $1,350,000 had been sold up to June 30, 1918.

INDIA BASIN BONDS.

These bonds were authorized under the statutes of 1909 for the amount of $1,000,000, to provide a fund for the acquisition by the Board of Harbor Commissioners of a necessary area for a tidal basin for wharves, piers, etc., in San Francisco. Litigation tied up action for several years. There have been sold of this issue bonds to the amount of $690,000.

BOND SINKING FUNDS.

There are a number of sinking funds created for the payment of interest and principal on state bonds. The creation of new funds of this character and the provisions for investments will further add to the work of this office. The sinking funds are enumerated and briefly explained as follows:

San Francisco Seawall Sinking Fund. Monthly transfers from the revenues of the San Francisco Harbor are made to provide for the payment of principal and interest on the San Francisco seawall bonds, act 1903. The balance in this fund on June 30, 1918, was $28,607.08.

Second San Francisco Seawall Sinking Fund. Monthly transfers from the revenues of the San Francisco harbor are made to provide for the payment of interest on the San Francisco harbor improvement bonds, act 1909.

Third San Francisco Seawall Sinking Fund. Monthly transfers from the revenues of the San Francisco harbor are made to provide for the payment of the principal and interest on the San Francisco harbor improvement bonds, act 1913.

India Basin Sinking Fund. Monthly transfers from the revenues of of the San Francisco harbor are made to provide for the payment of interest on the India Basin bonds.

State Highway Sinking Fund. This fund is replenished semi-annually by transfers from the general fund, and is used to pay interest on the state highway bonds. The counties reimburse the state for interest payments.

Second State Highway Sinking Fund. This fund is replenished semiannually by transfers from the general fund and is used to pay interest on the highway bonds, act 1915. The counties reimburse the state for interest payments.

Interest and Sinking Fund of the University of California Building Bonds. This fund is replenished semiannually by transfers from the general fund, and is used to pay interest on the University of California building bonds.

Sacramento State Building, Sinking and Interest Fund. This fund will be replenished by interest on investments and semiannually by transfers from the general fund, and used to pay principal and interest on the Sacramento state building bonds.

San Francisco State Building Sinking Fund. This fund is replenished by semiannual transfers from the general fund and used to pay principal and interest on the San Francisco state building bonds.

In submitting this report I desire to express appreciation for the co-operation given me by the various state officers and departments, and particularly to the State Controller, the Attorney General, and the members of the State Board of Control.

Respectfully submitted.

FRIEND WM. RICHARDSON,
State Treasurer.

CASH RECEIPTS.

Cash receipts in detail showing the funds of the state alphabetically arranged and the source from which they received payments for the sixty-eighth fiscal year.

Adult Blind Fund.		
Trustees Home for the Adult Blind		$35,466 67
Agnews Hospital Contingent Fund.		
Managers Agnews Hospital		63,765 94
Agricultural Society Contingent Fund.		
State Agricultural Society		85,009 90
Apple Standard Prosecution Fund.		
Commissioner of Horticulture		1,113 73
Ballot Paper Revolving Fund.		
Secretary of State		20,533 30
Banking Fund.		
Superintendent of Banks		100,831 96
Bond Investment Fund.		
State Treasurer, interest on bonds		50,140 00
Building and Loan Inspection Fund.		
Building and Loan Commissioner		9,142 86
Bureau of Labor Statistics Contingent Fund.		
Labor Commissioner		13,955 00
California Polytechnic School Contingent Fund.		
Trustees California Polytechnic School		16,176 41
California School for Deaf and Blind Contingent Fund.		
Directors California School for Deaf and Blind		7,553 25
California Training School for Girls Contingent Fund.		
Trustees California Training School for Girls		53 45
California Reformatory Contingent Fund.		
Warden, San Quentin Prison		7,162 90
California Stallion Registration Board Contingent Fund.		
California Stallion Registration Board		1,744 05
Chico Normal School Contingent Fund.		
Trustees, Chico Normal School		1,341 88
Commission Market Fund.		
State Market Commission		321 85
Compensation Insurance Fund.		
State Treasurer, interest and bonds		1,163,010 41
Corporation Commission Fund.		
Corporation Commissioner		21,140 58
Court of Appeal, First District, Library Fund.		
Court of Appeal, First District		1,853 79
Court of Appeal, Second District, Library Fund.		
Court of Appeal, Second District		2,089 81
Court of Appeal, Third District, Library Fund.		
Court of Appeal, Third District		666 86
Dentistry Fund.		
Board of Dental Examiners		11,537 74
Department of Engineering Revolving Fund.		
State Engineer		52,866 46
Dissolved Savings Bank Fund.		
State Treasurer, bonds		4,260 25
Estates Deceased Persons Fund.		
State Treasurer, bonds	$18,447 50	
County Treasurers	54,519 58	72,967 08
Fish and Game Preservation Fund.		
Fish and Game Commission	$327,425 11	
Department of Engineering	460 00	327,885 11
Folsom Prison Fund.		
Warden, Folsom Prison		15,354 31
Fresno Normal School Contingent Fund.		
Trustees Fresno Normal School		2,362 52

Cash Receipts—Continued.

State Funds and Sources from Which Payments Were Received for Sixty-eighth Fiscal Year.

General Fund.

State Treasurer, bonds, interest, fees for registering	$363,496 25
Interest on deposits	233,931 54
County Treasurers	4,867,679 96
Superintendent Public Instruction	115 47
Secretary of State	924,217 70
Insurance Commissioner	47,214 83
Surveyor General	3,203 19
Trustees Home for Adult Blind	400 00
Warden, San Quentin Prison	500 00
Warden, Folsom Prison	563 13
Fish and Game Commission	48,160 00
Superintendent State Printing	300 00
Court of Appeal, First District	1,850 81
Court of Appeal, Second District	2,086 29
Court of Appeal, Third District	666 84
Clerk of Supreme Court	6,220 20
Commission in Lunacy	4,265 45
Corporation Franchise Tax	15,649,356 24
Reclamation Board	101 50
State Engineer	36,648 81
Industrial Accident Commission	2,930 44
Superintendent Capitol Building and Grounds	935 77
Stockton Hospital	1,047 85
Industrial Welfare Commission	513 50
Agnews Hospital	510 00
Mining Bureau	523 60
Southern California Hospital	500 00
Dairy Bureau	3,965 08
Board of Control	16,727 94
Water Commission	10,460 06
Tax Commission	382 06
California School for Deaf and Blind	315 98
California School for Girls	381 63
California Polytechnic School	1,339 51
Sonoma Home	400 00
R. A. Waring	1,032 34
Pure Food Commission	1,414 95
Los Angeles Normal School	2,870 85
Attorney General	625 85
Napa Hospital	521 00
Board of Health	6,889 19
Whittier School	1,128 85
Board of Prison Directors	500 00
Mrs. Margaret S. McNaught	20 58
Preston School	907 38
State Controller	190 93
Horticultural Commissioner	2,513 31
Mendocino Hospital	400 00
J. Paul Miller	56 16
Fresno Normal School	500 00
Board of Education	6,917 64
Civil Service Commission	358 12
Board of Forestry	408 25
Board of Charities and Corrections	135 52
San Diego Normal School	461 50
Labor Commissioner	594 89
Immigration and Housing Commission	1,352 98
Purchasing Agent	25,045 04
Santa Barbara Normal	455 00
Inheritance tax department	3 01
Chico Normal School	149 10
Humboldt Normal School	45
H. P. McBeth	23 67
A. E. Graupner	7 86
J. C. Altman	25 34
Title Insurance and Trust Company	49 80
Superintendent Weights and Measures	1,070 23
Labor Commissioner	16 38
Adjutant General	191 00

Cash Receipts—Continued.

State Funds and Sources from Which Payments Were Received for Sixty-eighth Fiscal Year.

General Fund—Continued.		
Sixth District Agricultural Association	$90 56	
Maude Hiett	55 90	
E. R. Snyder	12 13	
C. L. Seavey	2 66	
A. P. Will	18 00	
Unknown, conscience refund	170 56	
Chas. Keane	16 36	
Legislative Counsel Bureau	113 33	
B. O. Boothby	93 00	
L. S. Woodbridge	8 00	
State Veterinary	310 20	
Will C. Wood	16 16	
City of San Diego	8 67	
W. F. Chandler	112 00	
Catherine Morrison	48 40	
San Jose Normal School	61 05	
Eureka Harbor Commission	16 65	
Governor of California	44 70	
Mrs. Virginia B. Albright	10 00	
Social Insurance Commission	21 74	
San Francisco Normal School	15 80	
Lyman Grimes	7 84	
A. W. Sanborn	4 60	
M. Madsen, Private Secretary	265 00	
Agricultural Society	500 00	$22,288,204 28
Highway Fund.		
Department of Engineering, refunds	$143,065 84	
Shasta County, donation	16,000 00	
Sonoma County, donation	25,000 00	
Santa Barbara County, donation	1,179 12	
San Luis Obispo County, donation	5,000 00	
Calaveras County, donation	10,000 00	
Humboldt County, donation	80,992 63	
Siskiyou County, donation	45,345 33	
Imperial County, donation	31,944 81	358,527 73
Humboldt Normal School Contingent Fund.		
Trustees, Humboldt Normal School		368 00
Industrial Accident Fund.		
Industrial Accident Commission		3,496 07
Insurance Commissioner's Special Fund.		
Insurance Commissioner		30,003 50
Jute Revolving Fund.		
Warden, San Quentin Prison		263,207 75
Library Fund.		
Trustees, State Library		1,475 30
Los Angeles Normal School Contingent Fund.		
Trustees, Los Angeles Normal School		2,135 17
Medical Examiners' Contingent Fund.		
Board of Medical Examiners		25,552 24
Mendocino Hospital Contingent Fund.		
Managers Mendicino Hospital	$16,584 62	
State Engineer, Department of Engineering	517 74	17,102 36
Mining Bureau Fund.		
Mining Bureau		1,911 44
Motor Vehicle Fund.		
State Engineer, Department of Engineering	$19,872 24	
Motor Vehicle Department	2,721,956 67	
E. D. Roberts, balance	5 10	2,741,834 01
Napa Hospital Contingent Fund.		
Managers, Napa Hospital	$67,357 32	
State Engineer, Department of Engineering	141 45	67,498 77
Norwalk Hospital Contingent Fund.		
Managers, Norwalk Hospital		8,700 49
Nurses Examination and Registration Fund.		
Board of Health		3,678 36

Cash Receipts—Continued.

State Funds and Sources from Which Payments Were Received for Sixty-eighth Fiscal Year.

Oil Protection Fund.		
State Treasurer, taxes	$140,186 48	
Mining Bureau	43 50	$140,229 98
Optometry Fund.		
Board of Optometry		3,264 10
Panama Pacific International Exposition Fund.		
Leo S. Robinson, Controller		1,065 33
Pharmacy Board Contingent Fund.		
Board of Pharmacy		3,440 16
Preston School Contingent Fund.		
Trustees, Preston School		4,724 78
Printing Fund.		
Superintendent State Printing		340,970 48
Railroad Commission Fund.		
Railroad Commission		51,131 86
Receivers' Fund.		
Consolidated Bank of Los Angeles		688 84
Reclamation Board Revolving Fund.		
Reclamation Board		42,240 78
Sacramento Drainage District Fund.		
County Treasurers		21 06
Sacramento and San Joaquin Drainage District Fund No. 1.		
County Treasurers	$2,000 07	
Reclamation Board	29 96	2,030 03
Sacramento and San Joaquin Drainage District Fund No. 5.		
County Treasurers		43,147 13
San Diego Normal School Contingent Fund.		
Trustees, San Diego Normal School		2,057 29
San Francisco Harbor Improvement Fund.		
San Francisco Harbor Commissioners		2,004,881 27
San Francisco Normal School Contingent Fund.		
Trustees, San Francisco Normal School		6,032 41
San Francisco Seawall Sinking Fund.		
State Treasurer, interest and redemption bonds		339 63
San Jose Normal School Contingent Fund.		
Trustees, San Jose Normal School		507 35
San Quentin Prison Fund.		
Warden, San Quentin Prison		156,227 11
San Quentin Prison Manufacturing Revolving Fund.		
Warden, San Quentin Prison		135,155 53
Santa Barbara Normal School Contingent Fund.		
Trustees, Santa Barbara Normal School		4,901 82
School Fund.		
State Treasurer, interest and redemption bonds	$360,169 03	
State Dairy Bureau	1,269 22	
County Treasurers	38,082 57	
Regents, University of California	9 00	
Attorney General	1,518 61	401,048 43
School Book Fund.		
Superintendent Public Instruction		7,861 78
School Land Fund.		
State Treasurer, interest and redemption bonds	$248,890 91	
County Treasurers	33,259 28	
Marine Bank, San Francisco	698 42	
Bank of Monterey	1 00	
Mutual Savings Bank, San Francisco	2 57	
Union Savings Bank, Modesto	781 06	
Bank of Martinez	3 24	
Petaluma Savings Bank	102 00	
First National Bank, Pomona	381 76	
Citizens Commercial & Savings Bank, Santa Ana	10 86	
Bank of Coalinga, unclaimed deposits twenty years	200 50	
Assessor, Inyo County	1,778 77	286,110 37

Cash Receipts—Continued.

State Funds and Sources from Which Payments Were Received for Sixty-eighth Fiscal Year.

School Land Deposit Fund.		
Surveyor General		$220 00
School Teachers Permanent Fund.		
State Treasurer, interest and bonds	$22,132 00	
County Treasurers	150,557 00	
Board of Education	10,631 80	
Treasurer, City of San Jose	385 00	
Treasurer, City of San Luis Obispo	42 00	
Trustees, San Francisco Normal School	344 50	
Trustees, San Diego Normal School	280 00	
Trustees, Humboldt Normal School	144 00	
Trustees, San Jose Normal School	597 00	
Trustees, Fresno Normal School	285 00	
Trustees, Chico Normal School	175 00	
Trustees, Santa Barbara Normal School	160 00	
Trustees, Los Angeles Normal School	859 00	186,592 30
School Teachers Retirement Salary Fund.		
Board of Education		75 36
Sixth District Agricultural Association Contingent Fund.		
Sixth District Agricultural Association		962 60
Sonoma Home Contingent Fund.		
Managers, Sonoma Home	$22,022 36	
State Engineer, Department of Engineering	76 99	22,099 35
Southern California Hospital Contingent Fund.		
Managers, Southern California Hospital		57,920 55
Stockton Hospital Contingent Fund.		
Managers, Stockton Hospital		42,141 57
Superintendent Capitol Building and Grounds Revolving Fund.		
Superintendent, Capitol Building and Grounds		50 36
Supreme Court Library Fund.		
Clerk, Supreme Court		2,785 10
Torrens Title Assurance Fund.		
County Recorders		2,897 56
United States Forest Reserve Fund.		
State Treasurer from U. S. Government		80,049 75
University Fund.		
State Treasurer, interest		49,845 00
Veterans' Home, Support and Maintenance Fund.		
Directors, Veterans Home	$10,352 69	
U. S. Government	89,787 74	100,140 43
Veterinary Medicine Examiners' Contingent Fund.		
Board Veterinary Medicine Examiners		400 00
Whittier School Contingent Fund.		
Trustees, Whittier School	$22,542 71	
State Engineer, Department of Engineering	2,869 60	25,412 31
Detective License Fee Fund.		
Board of Prison Directors		1,275 89
Third San Francisco Seawall Fund.		
State Treasurer, sale of bonds		1,047,750 00
Third San Francisco Seawall Sinking Fund.		
State Treasurer, accrued interest		3,388 88
India Basin Fund.		
State Treasurer, sale of bonds		625,000 00
India Basin Sinking Fund.		
State Treasurer, accrued interest		7,777 78
San Francisco Normal School Exposition Preservation Fund.		
Panama Pacific International Exposition Committee		15,201 88
Gravelly Ford Canal Company Condemnation Fund.		
Clerk, Superior Court, Madera County		5,800 00
Total cash receipts		$33,819,867 73

Summary of Receipts

Summary of Cash Receipts During the Sixty-eighth Fiscal Year, Summary of Receipts Receipts, Total Cash and Transfer Payments,

Funds	Cash receipts	Transfer receipts
Adult Blind Fund	$35,466 67	
Agnews Hospital Contingent Fund	63,765 94	
Agricultural Society Contingent Fund	85,009 90	
Apple Standard Prosecution Fund	1,113 73	
Ballot Paper Revolving Fund	20,533 30	
Banking Fund	100,831 96	
Bond Investment Fund	50,140 00	
Building and Loan Inspection Fund	9,142 86	
Bureau of Labor Statistics Contingent Fund	13,955 00	
California Polytechnic School Contingent Fund	16,176 41	
California School for Deaf and Blind Contingent Fund	7,553 25	
California Reformatory Contingent Fund	7,162 90	
California Stallion Registration Board Contingent Fund	1,744 05	
California Training School for Girls Contingent Fund	53 45	
Chico Normal School Contingent Fund	1,341 88	
Commission Market Fund	321 85	
Compensation Insurance Fund	1,163,010 41	
Corporation Commission Fund	21,140 58	
Court of Appeals, First District, Library Fund	1,853 79	
Court of Appeals, Second District, Library Fund	2,080 81	
Court of Appeals, Third District, Library Fund	633 86	
Dentistry Fund	11,537 74	
Department of Engineering Revolving Fund	52,863 46	
Dissolved Savings Bank Fund	4,269 25	
Estates of Deceased Persons Fund	72,967 08	
Fish and Game Preservation Fund	327,885 11	
Folsom Prison Fund	15,354 31	
Folsom Hospital Contingent Fund		
Forestry Fund		
Fresno Normal School Contingent Fund	2,362 52	
General Fund	22,288,204 28	$202,074 20
High School Fund		882,776 28
Highway Fund	358,527 73	
Highway Interest and Sinking Fund		1,120,000 00
Humboldt Normal School Contingent Fund	368 00	
Industrial Accident Fund	3,496 07	
Insurance Commissioner's Special Fund	30,003 50	
Interest and Sinking Fund		141,435 00
Jute Revolving Fund	263,207 75	
Library Fund	1,475 30	95,000 00
Los Angeles Normal Building and Improvement Fund		
Los Angeles Normal School Contingent Fund	2,135 17	
Medical Examiners' Contingent Fund	25,552 24	
Mendocino Hospital Contingent Fund	17,102 36	
Mining Bureau Fund	1,911 44	
Motor Vehicle Fund	2,741,834 01	1,179 12
Napa Hospital Contingent Fund	67,498 77	
Needles School District Bond Fund		
Norwalk Hospital Contingent Fund	8,700 49	
Nurses' Examination and Registration Fund	3,678 36	
Oil Protecton Fund	140,229 98	
Optometry Fund	3,264 10	
Panama-Pacific International Exposition Fund	1,065 33	
Pharmacy Board Contingent Fund	3,440 16	
Preston School of Industry Contingent Fund	4,724 78	
Printing Fund	340,970 48	
Railroad Commission Fund	51,131 86	
Railway Tax Fund		
Receivers' Fund	688 84	
Reclamation Board Revolving Fund	42,240 78	
Sacramento Drainage District Fund	21 06	
Sacramento and San Joaquin Drainage District Fund No. 1	2,030 03	8 80
Sacramento and San Joaquin Drainage District Fund No. 5	43,147 13	

and Payments.

and Payments, Balances Brought Forward July 1, 1916, Total Cash and Transfer and Balances Carried Forward June 30, 1917.

Total of cash and transfer receipts	Balances brought forward July 1, 1916	Total of receipts and balances	Cash payments	Transfer payments	Total of cash and transfer payments	Balances carried forward June 30, 1917
$35,466 67	$11,037 54	$46,504 21	$33,640 25	----------	$33,640 25	$12,863 96
63,765 94	53,461 56	117,227 50	85,301 69	----------	85,301 69	31,925 81
85,009 90	8,475 49	93,485 39	84,285 62	----------	84,285 62	9,199 77
1,113 73	3,182 77	4,296 50	2,733 98	----------	2,733 98	1,562 52
20,533 30	187 40	20,720 70	18,425 83	$608 30	19,034 13	1,686 57
100,831 96	24,722 87	125,554 83	92,768 25	----------	92,768 25	32,786 58
50,140 00	----------	50,140 00	----------	50,140 00	50,140 00	----------
9,142 83	13,747 46	22,890 32	8,616 62	----------	8,616 62	14,273 70
13,955 00	6,405 80	20,360 80	8,228 11	----------	8,228 11	12,132 69
16,176 41	3,250 68	19,427 09	18,032 85	----------	18,032 85	1,394 24
7,553 25	1,208 16	8,761 41	6,549 11	----------	6,549 11	2,212 30
53 45	801 69	855 14	691 89	----------	691 89	163 25
7,162 90	5,250 14	12,413 04	8,818 93	----------	8,818 93	3,594 11
1,744 05	5,539 62	7,283 67	3,363 31	----------	3,363 31	3,920 36
1,341 88	2,767 44	4,109 32	1,465 12	----------	1,465 12	2,644 20
321 85	16,842 83	17,164 68	12,689 04	----------	12,689 04	4,475 64
1,163,010 41	308,554 70	1,471,565 11	1,259,382 84	----------	1,259,382 84	212,182 27
21,140 58	2,562 99	23,703 57	14,672 17	----------	14,672 17	9,031 40
1,853 79	6,737 43	8,591 22	2,256 45	----------	2,256 45	6,334 77
2,089 81	6,871 89	8,961 70	1,346 71	----------	1,346 71	7,614 99
666 86	1,611 67	2,278 53	571 42	----------	571 42	1,707 11
11,537 74	10,719 67	22,257 41	13,088 47	----------	13,088 47	9,168 94
52,866 46	6,265 43	59,131 89	50,903 78	----------	50,903 78	8,228 11
4,260 25	11,723 26	15,983 51	3,921 46	----------	3,921 46	12,062 05
72,967 08	61,787 47	134,754 55	80,243 61	----------	80,243 61	54,510 94
327,885 11	56,825 43	384,710 54	318,307 88	----------	318,307 88	66,402 63
15,354 31	11,044 79	26,399 10	11,266 40	----------	11,266 40	15,132 70
----------	179 00	179 00	----------	----------	----------	179 00
----------	169 88	169 88	----------	----------	----------	169 88
2,362 52	2,162 74	4,525 26	1,988 54	----------	1,988 54	2,536 72
22,490,278 48	5,531,241 37	28,021,519 85	11,349,371 50	9,169,202 67	20,518,574 17	7,502,945 68
882,776 28	3,140 91	885,917 19	873,320 66	----------	873,320 66	12,596 53
358,527 73	1,500,847 23	1,859,374 96	1,853,287 96	1,179 12	1,854,467 08	4,907 88
1,120,000 00	----------	1,120,000 00	720,000 00	----------	720,000 00	400,000 00
368 00	129 02	497 02	242 05	----------	242 05	254 97
3,496 07	3,259 14	6,755 21	1,005 91	----------	1,005 91	5,749 30
30,003 50	1,170 09	31,173 59	26,515 68	----------	26,515 68	4,657 91
141,435 00	70,717 50	212,152 50	141,435 00	----------	141,435 00	70,717 50
263,207 75	182,428 63	445,636 38	248,826 27	19,064 56	267,890 83	177,745 55
96,475 30	16,329 58	112,804 88	103,751 65	----------	103,751 65	9,053 23
----------	6,427 13	6,427 13	6,423 81	----------	6,423 81	3 32
2,135 17	1,282 65	3,417 82	2,000 95	----------	2,000 95	1,416 87
25,552 24	10,644 84	36,197 08	28,513 09	----------	28,513 09	7,683 99
17,102 36	39,206 16	56,308 52	38,205 76	----------	38,205 76	18,102 76
1,911 44	503 04	2,414 48	----------	28 23	28 23	2,386 25
2,743,013 13	1,811,116 50	4,554,129 63	2,531,096 57	----------	2,531,096 57	2,023,033 06
67,498 77	37,997 52	105,496 29	81,439 91	----------	81,439 91	24,056 38
----------	183 75	183 75	----------	----------	----------	183 75
8,700 49	477 50	9,177 99	5,817 50	----------	5,817 50	3,360 49
3,678 36	38,815 16	42,493 52	8,241 60	----------	8,241 60	34,251 92
140,229 98	2,539 13	142,769 11	52,062 27	20,000 00	72,062 27	70,706 84
3,264 10	4,138 06	7,402 16	6,158 25	----------	6,158 25	1,243 91
1,065 33	14,702 08	15,767 41	301 70	----------	301 70	15,465 71
3,440 16	8,912 98	12,353 14	2,364 34	----------	2,364 34	9,988 80
4,724 78	9,574 95	14,299 73	2,567 25	23 63	2,590 88	11,708 85
340,970 48	35,445 94	376,416 42	372,128 89	----------	372,128 89	4,287 53
51,131 86	30,620 70	81,752 56	52,883 17	----------	52,883 17	28,869 39
----------	30,251 36	30,251 36	----------	----------	----------	30,251 36
688 84	4,964 74	5,653 58	67 25	----------	67 25	5,586 33
42,240 78	24,376 25	63,617 03	53,029 05	8 80	53,037 85	13,579 18
21 06	112 04	133 10	----------	----------	----------	133 10
2,038 83	47,577 21	49,616 04	44,941 59	----------	44,941 59	4,674 45
43,147 13	----------	43,147 13	11,345 06	----------	11,345 06	31,802 07

Summary of Receipts

Summary of Cash Receipts During the Sixty-eighth Fiscal Year, Summary of Receipts Receipts, Total Cash and Transfer Payments,

Funds	Cash receipts	Transfer receipts
San Diego Harbor Improvement Fund	--------------	--------------
San Diego Normal School Contingent Fund	$2,057 29	--------------
San Francisco Harbor Improvement Fund	2,004,881 27	--------------
San Francisco Normal School Contingent Fund	6,032 41	--------------
San Francisco Seawall Fund	--------------	--------------
San Francisco Seawall Sinking Fund	339 63	$151,106 91
San Francisco State Building Fund	--------------	--------------
San Francisco State Building Interest and Sinking Fund	--------------	59,200 00
San Jose Harbor Improvement Fund	--------------	--------------
San Jose Normal School Contingent Fund	507 35	--------------
San Quentin Prison Fund	156,227 11	19,034 56
San Quentin Prison Manufacturing Revolving Fund	135,155 53	--------------
Santa Barbara Normal School Contingent Fund	4,901 82	--------------
School Fund	401.048 43	5,364,145 00
School Book Fund	7,861 78	--------------
School Land Fund	286,110 37	25,310 00
School Land Deposit Fund	220 00	--------------
School Teachers' Permanent Fund	186,592 30	157,260 53
School Teachers' Retirement Salary Fund	75 36	210,000 00
Second San Francisco Seawall Fund	--------------	--------------
Second San Francisco Seawall Sinking Fund	--------------	420,000 00
Sixth District Agricultural Association Contingent Fund	962 60	--------------
Sonoma Home Contingent Fund	22,099 35	--------------
Southern California Hospital Contingent Fund	57,920 55	--------------
State University Fund	--------------	1,067,868 71
Stockton Hospital Contingent Fund	42,141 57	--------------
Superintendent Capitol Building and Grounds Revolving Fund	50 36	100 49
Supreme Court Library Fund	2,785 10	--------------
Textbook Royalty Fund	--------------	--------------
Torrens Title Assurance Fund	2,897 56	--------------
United States Forest Reserve Fund	80,049 75	--------------
University Fund	49,845 00	--------------
University of California Building Fund	--------------	--------------
University of California Building Interest and Sinking Fund	--------------	81,000 00
Veterans' Home, Support and Maintenance Fund	100,140 43	135,000 00
Veterinary Medicine Examiners' Contingent Fund	400 00	--------------
War Bond Fund	--------------	--------------
Whittier School Contingent Fund	25,412 31	--------------
Detective License Fee Fund	1,275 89	--------------
Third San Francisco Seawall Fund	1,047,750 00	--------------
Third San Francisco Seawall Sinking Fund	3,388 88	16,611 12
India Basin Fund	625,000 00	--------------
India Basin Sinking Fund	7,777 78	4,722 22
San Francisco Normal School Exposition Preservation Fund	15.201 88	--------------
Gravelly Ford Canal Company Condemnation Fund	5,800 00	--------------
Totals	$33,819,867 73	$10,153,862 94

and Payments—Continued.

and Payments, Balances Brought Forward July 1, 1916, Total Cash and Transfer and Balances Carried Forward June 30, 1917.

Total of cash and transfer receipts	Balances brought forward July 1, 1916	Total of receipts and balances	Cash payments	Transfer payments	Total of cash and transfer payments	Balances carried forward June 30, 1917
----------	$3,587 96	$3,587 96	----------	----------	----------	$3,587 96
$2,057 29	327 94	2,385 23	$1,679 02	----------	$1,679 02	706 21
2,004,881 27	292,577 19	2,297,458 46	1,354,278 39	$622,363 59	1,976,641 98	320,816 48
6,032 41	6,130 97	12,163 38	2,506 22	----------	2,506 22	9,657 16
----------	5,492 88	5,492 88	5,492 88	----------	5,492 88	----------
151,446 54	54,375 56	205,822 10	159,780 00	----------	159,780 00	46,042 10
----------	999,893 18	999,893 18	15,925 53	----------	15,925 53	983,967 65
59,200 00	----------	59,200 00	59,200 00	----------	59,200 00	----------
----------	2,495 27	2,495 27	----------	----------	----------	2,495 27
507 35	36 14	543 49	----------	----------	----------	543 49
175,291 67	88,163 88	263,458 55	229,644 66	----------	229,644 66	33,813 89
135,155 53	26,790 07	161,945 60	114,670 06	----------	114,670 06	47,275 54
4,901 82	4,849 00	9,750 82	3,229 10	----------	3,229 10	6,521 72
5,765,193 43	254,898 28	6,020,091 71	5,719,672 90	240 00	5,719,912 90	300,178 81
7,861 78	378,618 70	386,480 48	130,206 72	----------	130,206 72	256,273 76
311,420 37	233,343 49	544,763 86	468,944 52	----------	468,944 52	75,819 34
220 00	7,500 00	7,720 00	180 00	----------	180 00	7,540 00
343,852 83	142,649 74	486,502 57	146,217 75	210,000 00	356,217 75	130,284 82
210,075 36	51,756 04	261,831 40	188,953 52	----------	188,953 52	72,877 88
----------	616,340 88	616,340 88	592,318 45	----------	592,318 45	24,022 43
420,000 00	----------	420,000 00	360,000 00	• 60,000 00	420,000 00	----------
962 60	2,216 18	3,178 78	867 73	----------	867 73	2,311 05
22,099 35	21,405 64	43,504 99	29,643 48	----------	29,643 48	13,861 51
57,920 55	45,993 67	103,914 22	95,491 80	----------	95,491 80	8,422 42
1,067,868 71	----------	1,067,868 71	1,067,868 71	----------	1,067,868 71	----------
42,141 57	17,822 61	59,964 18	50,216 48	----------	50,216 48	9,747 70
150 85	5,369 33	5,520 18	2 25	----------	2 25	5,517 93
2,785 10	6,276 45	9,061 55	1,144 73	1,004 04	2,148 77	6,912 78
----------	340 43	340 43	----------	----------	----------	340 43
2,897 56	431 62	3,329 18	----------	----------	----------	3,329 18
80,049 75	----------	80,049 75	77,988 94	----------	77,988 94	2,060 81
49,845 00	----------	49,845 00	49,845 00	----------	49,845 00	----------
----------	1,568,008 80	1,568,008 80	1,264,220 87	----------	1,264,220 87	303,787 93
81,000 00	----------	81,000 00	81,000 00	----------	81,000 00	----------
235,140 43	7,589 06	242,729 49	224,917 05	----------	224,917 05	17,812 44
400 00	351 00	751 00	229 05	----------	229 05	521 95
----------	2,829 76	2,829 76	----------	----------	----------	2,829 76
25,412 31	13,537 44	38,949 75	15,391 09	----------	15,391 09	23,558 66
1,275 89	----------	1,275 89	----------	----------	----------	1,275 89
1,047,750 00	----------	1,047,750 00	140,486 29	----------	140,486 29	907,263 71
20,000 00	----------	20,000 00	20,000 00	----------	20,000 00	----------
625,000 00	----------	625,000 00	611,431 80	----------	611,431 80	13,568 20
12,500 00	----------	12,500 00	12,500 00	----------	12,500 00	----------
15,201 88	----------	15,201 88	15,201 88	----------	15,201 88	----------
5,800 00	----------	5,800 00	----------	----------	----------	5,800 00
$13,973,730 67	$14,975,233 12	$58,948,963 79	$34,072,251 89	$10,153,862 94	$44,226,114 83	$14,722,848 96

Receipts from County Treasurers.

Receipts from County Treasurers for the Sixty-eighth Fiscal Year.

Counties	General fund	School fund	School land fund	Estates deceased persons fund
Alameda	$310,458 80	$248 00		$714 20
Alpine	14 17	841 66	$1,191 15	
Amador	7,309 46	56 00		
Butte	21,111 60	168 77	144 00	
Calaveras	1,299 75	23 00		
Colusa	28,991 96	58 80	200 00	
Contra Costa	608,298 45	5 25		966 28
Del Norte	319 19			
El Dorado	12,395 47	497 95		147 55
Fresno	46,630 69	1,403 31	1,655 23	
Glenn	16,699 59	89 60		558 80
Humboldt	34,461 04	77 20		
Imperial	19,259 70	2,251 32	200 00	1,474 56
Inyo	1,211 71	676 35	3,941 67	
Kern	47,740 93	3,164 65	2,116 05	
Kings	9,752 48	66 40		
Lake	617 32	436 46	960 00	
Lassen	558 37	2.310 97	5,358 42	
Los Angeles	975,178 26	2,116 37	368 70	30,676 56
Madera	11,392 15	151 82	320 00	
Marin	16,289 44			
Mariposa	2,228 62	261 50	1,191 14	19 80
Mendocino	137,224 55	2,568 30	1,603 00	9,488 28
Merced	15,581 61	577 02	954 02	
Modoc	1,544 60	1,183 35	900 00	
Mono	2,142 15	1,084 17	515 13	480 21
Monterey	37,453 74	625 97	1,288 00	
Napa	8,990 99	103 60		265 22
Nevada	3,353 39	75 66		1,598 03
Orange	78,058 02	12 00		
Placer	10,939 53	25 17		
Plumas	1,531 45	33 60		
Riverside	10,991 22	2,262 89	1,508 00	
Sacramento	78,748 36			
San Benito	13,008 45	904 30	779 46	
San Bernardino	23,367 59	8,537 09	3,360 00	
San Diego	136,441 19	657 90	160 00	
San Francisco	1,330,851 28			
San Joaquin	63,176 81	319 79	360 00	7,801 64
San Luis Obispo	45,474 75	1,085 62	1,169 43	97 78
San Mateo	109,283 62			
Santa Barbara	95,637 50	161 40		92 79
Santa Clara	70,847 34	441 54	281 53	
Santa Cruz	17,507 87			94 05
Shasta	24,130 29	795 88		11 99
Sierra	773 94			
Siskiyou	23,300 55	160 80	760 00	
Solano	120,715 70	156 00		
Sonoma	82,118 79	107 32		
Stanislaus	17,086 43	76 00		31 84
Sutter	6,551 00			
Tehama	12,663 56	741 61	812 56	
Trinity	782 52	54 00		
Tulare	24,532 58	223 59	884 69	
Tuolumne	9,772 44	124 22	277 10	
Ventura	26,535 93	11 20		
Yolo	46,659 99	67 20		
Yuba	7,681 08			
Totals	$4,867,679 96	$38,082 57	$33,259 28	$54,519 58

Receipts from County Treasurers—Continued.

Receipts from County Treasurers for the Sixty-eighth Fiscal Year.

Counties	School teachers' permanent fund	Sacramento and San Joaquin drainage district fund No. 1	Sacramento and San Joaquin drainage district fund No. 5	Sacramento drainage district
Alameda	$16,417 00			
Alpine	25 00			
Amador	581 00			
Butte	1,744 00	$306 15		
Calaveras	563 00			
Colusa	703 00	129 48		
Contra Costa	2,711 00			
Del Norte	247 00			
El Dorado	505 35			
Fresno	5,978 00	8 53		
Glenn	717 00	58 48		
Humboldt	1,919 00			
Imperial	1,675 00			
Inyo	384 00			
Kern	2,654 25			
Kings	987 00			
Lake	489 80			
Lassen	548 00			
Los Angeles	32,775 00			
Madera	791 70			
Marin	1,065 50			
Mariposa	245 00			
Mendocino	1,704 70			
Merced	1,312 00	114 25		
Modoc	538 10			
Mono	75 00			
Monterey	1,491 25			
Napa	1,158 00			
Nevada	929 00			
Orange	2,974 00			
Placer	1,105 00			
Plumas	183 00			
Riverside	3,336 00			
Sacramento	4,947 00	390 53	$29,334 68	
San Benito	537 00			
San Bernardino	4,661 00			
San Diego	5,753 00			
San Francisco	13,105 00			
San Joaquin	2,961 00	355 76	13,812 45	
San Luis Obispo	1,538 25			
San Mateo	2,121 00			
Santa Barbara	1,805 00			
Santa Clara	4,758 00			
Santa Cruz	1,784 00			
Shasta	1,112 00			
Sierra	167 00			
Siskiyou	1,093 00			
Solano	1,693 00	142 81		$21 06
Sonoma	3,091 00			
Stanislaus	2,144 00			
Sutter	481 00	412 86		
Tehama	1,334 00			
Trinity	204 00			
Tulare	3,081 00			
Tuolumne	571 00			
Ventura	1,626 10			
Yolo	822 00	81 22		
Yuba	633 00			
Totals	$150,557 00	$2,000 07	$43,147 13	$21 06

San Francisco Seawall Sinking Fund.

Transactions in the San Francisco Seawall Sinking Fund during the Sixty-eighth Fiscal Year.

RECEIPTS.

Date	Items	Investment returned to fund	Interest on investments	Principal	Transfer of interest	Total
7/ 1/16	To amounts brought forward	$1,159,973 75	$160,171 87	$984,609 32	$587,533 31	$2,892,288 25
7/ 1/16	To trans. from S. F. H. I. Fund			9,696 36	3,106 63	
7/ 1/16	To interest on bond		7 31			
8/ 1/16	To trans. from S. F. H. I. Fund			9,696 36	3,106 73	
9/ 1/16	To trans. from S. F. H. I. Fund			9,696 36	3,106 63	
10/ 2/16	To trans. from S. F. H. I. Fund			9,696 36	3,106 63	
11/ 1/16	To trans. from S. F. H. I. Fund			9,696 36	3,106 63	
12/ 1/16	To trans. from S. F. H. I. Fund			9,696 36	3,106 63	
1/ 2/17	To trans. from S. F. H. I. Fund			9,696 36	3,106 63	
1/ 4/17	To interest on bond		7 32			
1/ 4/17	To redemption of bond	325 00				
2/ 1/17	To trans. from S. F. H. I. Fund			9,607 14	2,690 00	
3/ 1/17	To trans. from S. F. H. I. Fund			9,607 14	2,690 00	
4/ 2/17	To trans. from S. F. H. I. Fund			9,607 14	2,690 00	
5/ 1/17	To trans. from S. F. H. I. Fund			9,607 14	2,690 00	
6/ 1/17	To trans. from S. F. H. I. Fund			9,607 14	2,690 00	
	Total					151,446 54
	Total of transfer of principal			$1,100,519 54		
	Total of interest on investment applied to principal		$160,186 50	160,186 50		
	Total investment returned	$1,160,298 75		1,160,298 75		
	Totals			$2,421,004 79	$622,730 00	$3,043,734 79

DISBURSEMENTS.

Date	Items	Redemption of bonds	Transfer	Investment of principal	Interest paid	Total
7/ 1/16	By amounts brought forward	$1,068,000 00	$5,091 25	$1,174,202 69	$590,640 00	$2,837,933 94
12/11/16	By payment semiannual interest				18,640 00	
1/16/17	By redemption of bonds	125,000 00				
6/ 9/17	By payment semiannual interest				16,140 00	159,780 00
	Totals	$1,193,000 00	$5,091 25	$1,174,202 69	$625,420 00	$2,997,713 94
6/30/17	By redemption of San Francisco Seawall bonds			1,193,000 00		
	By transfers			5,091 25		
	By balance in fund not invested			46,042 10		46,042 10
	Totals			$2,418,336 04	$625,420 00	$3,043,756 04

Second San Francisco Seawall Sinking Fund.

Transactions in the Second San Francisco Seawall Sinking Fund during the Sixty-eighth Fiscal Year.

RECEIPTS.

Date	Items	Interest	Transfer of interest	Total
7/ 1/16	To amounts brought forward	$112,279 56	$992,140 44	$1,104,420 00
7/ 1/16	To monthly transfer from S. F. H. I. Fund		30,000 00	
8/ 1/16	To monthly transfer from S. F. H. I. Fund		30,000 00	
9/ 1/16	To monthly transfer from S. F. H. I. Fund		30,000 00	
10/ 2/16	To monthly transfer from S. F. H. I. Fund		30,000 00	
11/ 1/16	To monthly transfer from S. F. H. I. Fund		30,000 00	
12/ 1/16	To monthly transfer from S. F. H. I. Fund		30,000 00	
12/ 1/16	To transfer from General Fund		30,000 00	
1/ 2/17	To monthly transfer from S. F. H. I. Fund		30,000 00	
2/ 1/17	To monthly transfer from S. F. H. I. Fund		30,000 00	
3/ 1/17	To monthly transfer from S. F. H. I. Fund		30,000 00	
4/ 2/17	To monthly transfer from S. F. H. I. Fund		30,000 00	
5/ 1/17	To monthly transfer from S. F. H. I. Fund		30,000 00	
6/ 1/17	To monthly transfer from S. F. H. I. Fund		30,000 00	
6/ 8/17	To transfer from General Fund		30,000 00	420,000 00
		$112,279 56	$1,412,140 44	$1,524,420 00

DISBURSEMENTS.

Date	Items	Interest paid	Total
			$1,104,420 00
7/ 1/16	By transfer to General Fund	$30,000 00	
12/11/16	By payment semiannual interest	180,000 00	
1/ 2/17	By transfer to General Fund	30,000 00	
6/ 9/17	By payment semiannual interest	180,000 00	420,000 00
		$420,000 00	$1,524,420 00

Second San Francisco Seawall Fund.

Transactions in the Second San Francisco Seawall Fund during the Sixty-eighth Fiscal Year.

RECEIPTS.

Date	Items	Amount
7/ 1/16	To balance on hand	$616,340 88

DISBURSEMENTS.

Date	Items	Amount
7/ 5/16	By Healy-Tibbitts Construction Company	$18,480 50
7/ 5/16	By Healy-Tibbitts Construction Company	828 47
7/ 6/16	By Robt. W. Hunt & Company	107 76
7/11/16	By Pope & Talbot	42 50
7/17/16	By Healy-Tibbitts Construction Company	932 53
7/17/16	By Healy Tibbitts Construction Company	570 00
7/19/16	By F. W. Richardson, State Treasurer	7,965 12
7/24/16	By New York Insulated Wire Company	381 91
7/24/16	By Pacific Portland Cement Company	3,222 60
7/24/16	By James H. Hardy	169 65
7/25/16	By Hammond Lumber Company	230 86
7/25/16	By J. M. Colman Company	7,852 44
7/25/16	By William A. Newsom	297 60
7/25/16	By Bashford Smith	36 34
7/25/16	By McNab & Smith	6 00
7/28/16	By Henry Cowell Lime and Cement Company	2 87
7/29/16	By Clinton Construction Company	10,621 13
8/ 5/16	By Healy-Tibbitts Construction Company	377 85
8/ 5/16	By Rector System Gas Heating Company, Inc.	238 50
8/ 8/16	By U. S. Metal Products Company	3,440 63
8/17/16	By Healy-Tibbitts Construction Company	2,850 00
8/17/16	By Healy-Tibbitts Construction Company	157 13
8/18/16	By Clinton Construction Company	776 42
8/18/16	By Clinton Construction Company	110 88
8/18/16	By Clinton Construction Company	8,496 90
8/18/16	By Crowley Launch and Tug Boat Company	5 00
8/25/16	By J. Eugene Stevens	11 10
8/26/16	By Associated Manufacturers' Importing Company	650 34
8/26/16	By Bashford Smith	19 60
8/26/16	By J. M. Colman Company	2,609 62
8/26/16	By Pope & Talbot	37 50
8/26/16	By J. M. Colman Company	2,617 48
8/30/16	By Pacific Creosoting Company	5,887 50
8/30/16	By J. M. Colman Company	8,119 61
9/ 2/16	By E. Lauterbach	6 50
9/ 6/16	By New York Insulated Wire Company	240 49
9/ 6/16	By James H. Hardy, Inc.	287 89
9/ 8/16	By Healy-Tibbitts Construction Company	200 52
9/ 8/16	By Healy-Tibbitts Construction Company	1,425 00
9/11/16	By Pacific Portland Cement Company	3,780 20
9/11/16	By Clinton Construction Company	77 47
9/13/16	By F. W. Richardson, State Treasurer	5,298 36
9/14/16	By W. P. Fuller & Company	29 00
9/18/16	By The California Door Company	1 76
9/18/16	By McNab & Smith	10 00
9/18/16	By McNab & Smith	5 00
9/18/16	By Bashford Smith	3 96
9/18/16	By U. S. Metal Products Company	4,587 50
9/19/16	By F. W. Richardson, State Treasurer	6,138 59
9/22/16	By Healy-Tibbitts Construction Company	6,527 74
9/23/16	By Western Electric Company	617 69
9/23/16	By Dunham, Carrigan & Hayden Company	7 92
9/23/16	By John A. Roeblings Sons Company	26 50
9/23/16	By G. W. McGinn & Company	2,496 87
9/23/16	By G. W. McGinn & Company	530 81

Second San Francisco Seawall Fund—Continued.

Transactions in the Second San Francisco Seawall Fund during the Sixty-eighth Fiscal Year.

DISBURSEMENTS—Continued.

Date	Items	Amount
9/25/16	By The Ajax Foundry Company	$16 00
9/25/16	By Pacific Hardware and Steel Company	3 25
9/26/16	By Pacific Portland Cement Company	5,034 80
9/26/16	By George H. Tay Company	138 53
9/26/16	By James H. Hardy, Inc.	261 91
9/26/16	By Baker & Hamilton	42 10
9/26/16	By Drendell Electrical and Manufacturing Company	10 40
9/26/16	By S. B. Peterson Company	318 78
9/27/16	By Loop Lumber Company	13 32
9/27/16	By California Steam and Plumbing Supply Company	162 60
9/27/16	By Westinghouse Lamp Company	32 21
9/29/16	By Robt. W. Hunt & Company	213 95
10/ 2/16	By W. P. Fuller & Company	63 24
10/ 2/16	By Clinton Construction Company	19,118 02
10/ 3/16	By J. Eugene Stevens	17 35
10/ 6/16	By Healy-Tibbitts Construction Company	8,995 49
10/10/16	By J. M. Colman Company	2,706 54
10/10/16	By Pacific Creosoting Company	1,962 50
10/10/16	By Rudolph T. Schwartz	16 50
10/17/16	By F. W. Richardson, State Treasurer	4,441 93
10/17/16	By Pope & Talbot	50 00
10/17/16	By Daniel Contracting Company	307 50
10/17/16	By U. S. Metal Products Company	1,564 00
10/17/16	By Healy-Tibbitts Construction Company	9,791 62
10/17/16	By Daniel Contracting Company	2,507 45
10/17/16	By Daniel Contracting Company	3,858 05
10/19/16	By Bay Development Company	14 00
10/20/16	By Chas. R. McCormick & Company	47 50
10/23/16	By Clinton Construction Company	23,366 48
10/23/16	By S. B. Peterson Company	265 65
10/24/16	By Woodin & Little	169 25
10/24/16	By Bashford Smith	18 14
10/24/16	By Western Electric Company	11 35
10/24/16	By Standard Crushed Rock Company	2 50
10/24/16	By Pacific Hardware and Steel Company	36 50
10/24/16	By Empire Planing Mill	39 25
10/24/16	By Pacific States Electric Company	3 81
10/24/16	By McNab & Smith	2 00
10/25/16	By P. David Company	8 95
10/27/16	By Pacific Portland Cement Company	10,225 40
10/27/16	By Improved Electric Company	248 08
10/27/16	By Baker & Hamilton	19 00
10/27/16	By James H. Hardy, Inc.	16 93
10/27/16	By John Finn Metal Works	7 90
10/27/16	By George H. Tay Company	1 62
11/ 3/16	By St. Helens Creosoting Company	9,813 50
11/ 3/16	By St. Helens Creosoting Company	4,500 04
11/ 8/16	By Robt. W. Hunt & Company	170 41
11/13/16	By Chas. R. McCormick & Company	42 50
11/13/16	By St. Helens Creosoting Company	1,500 02
11/15/16	By W. P. Fuller & Company	161 52
11/15/16	By Healy-Tibbitts Construction Company	6,061 48
11/15/16	By S. B. Peterson Company	796 95
11/15/16	By Rector System Gas Heating Company	397 50
11/15/16	By J. M. Colman Company	11,582 41
11/17/16	By F. W. Richardson, State Treasurer	3,924 79
11/17/16	By Rector System Gas Heating Company	100 00
11/17/16	By St. Helens Creosoting Company	10,293 64
11/21/16	By J. Eugene Stevens	11 00
11/21/16	By St. Helens Creosoting Company	3,271 17
11/21/16	By McNab & Smith	2 50
11/21/16	By Bashford Smith	20 04
11/23/16	By Clinton Construction Company	4,248 45

Second San Francisco Seawall Fund—Continued.

Transactions in the Second San Francisco Seawall Fund during the Sixty-eighth Fiscal Year.

DISBURSEMENTS—Continued.

Date	Items	Amount
11/23/16	By Pacific Portland Cement Company	$4,206 60
11/23/16	By Blake Bros. Company	2,612 20
11/27/16	By Chas. Stein	1 40
11/28/16	By New York Insulated Wire Company	81 08
11/29/16	By Robt. W. Hunt & Company	418 43
12/ 5/16	By St. Helens Creosoting Company	783 58
12/ 5/16	By St. Helens Creosoting Company	4,911 96
12/ 9/16	By Daniel L. Bienfield & Company	743 31
12/ 9/16	By Daniel L. Bienfield & Company	3,353 66
12/ 9/16	By Daniel L. Bienfield & Company	1,967 42
12/ 9/16	By Daniel L. Bienfield & Company	327 53
12/ 9/16	By Chas. R. McCormick & Company	30 00
12/15/16	By J. M. Colman Company	3,860 80
12/15/16	By Daniel L. Bienfield & Company	25 67
12/15/16	By Daniel L. Bienfield & Company	2,713 32
12/15/16	By Healy-Tibbitts Construction Company	4,662 67
12/15/16	By Healy-Tibbitts Construction Company	3,792 00
12/16/16	By Bay Development Company	1 10
12/16/16	By Marshall Newell Supply Company	20
12/16/16	By St. Helens Creosoting Company	3,431 22
12/19/16	By F. W. Richardson, State Treasurer	4,781 32
12/19/16	By J. Eugene Stevens	11 85
12/20/16	By Pacific Portland Cement Company	664 20
12/20/16	By Hammond Lumber Company	454 86
12/20/16	By Western Electric Company	438 95
12/22/16	By Clinton Construction Company	12,745 35
12/22/16	By Blake Bros. Company	7,506 95
12/27/16	By Western Fuel Company	2 50
12/27/16	By Dunham, Carrigan & Hayden Company	90
1/ 4/17	By Robt. W. Hunt & Company	64 43
1/ 5/17	By Pope & Talbot	20 00
1/ 5/17	By St. Helens Creosoting Company	1,637 32
1/16/17	By J. M. Colman Company	3,170 71
1/16/17	By Rector System Gas Heating Company	56 00
1/17/17	By Blake Bros. Company	40 35
1/17/17	By F. W. Richardson, State Treasurer	7,880 71
1/17/17	By Healy-Tibbitts Construction Company	3,730 14
1/17/17	By Healy-Tibbitts Construction Company	1,896 00
1/18/17	By Clinton Construction Company	58,807 50
1/18/17	By Blake Bros. Company	7,243 42
1/19/17	By Bashford Smith	67 52
1/19/17	By Western Electric Company	36 39
1/19/17	By Healy-Tibbitts Construction Company	433 68
1/20/17	By Crandley Rubber and Supply Company	8 33
1/20/17	By J. Eugene Stevens	11 30
1/22/17	By Daniel L. Bienfield & Company	2,353 45
1/22/17	By McNab & Smith	27 50
1/22/17	By Pacific Hardware and Steel Company	1 22
1/22/17	By Hammond Lumber Company	31 64
1/25/17	By Holabird Reynolds Company	101 67
1/25/17	By Pacific Portland Cement Company	369 00
1/26/17	By Jim Wilder	7 50
1/26/17	By Henry C. Peterson	30 00
1/27/17	By Robt. W. Hunt & Company	45 64
2/ 2/17	By Western Fuel Company	5 50
2/13/17	By Healy-Tibbitts Construction Company	7,460 28
2/13/17	By Healy-Tibbitts Construction Company	1,896 00
2/14/17	By Blake Bros. Company	9,568 66
2/20/17	By F. W. Richardson, State Treasurer	6,960 33
2/21/17	By McNab & Smith	4 00
2/21/17	By Bashford Smith	129 14
2/21/17	By J. M. Colman Company	1,056 91
2/24/17	By Hammond Lumber Company	478 10

Second San Francisco Seawall Fund—Continued.

Transactions in the Second San Francisco Seawall Fund during the Sixty-eighth Fiscal Year.

DISBURSEMENTS—Continued.

Date	Items	Amount
2/28/17	By Western Fuel Company	$12 48
3/ 7/17	By Healy-Tibbitts Construction Company	551 50
3/ 8/17	By St. Helens Creosoting Company	5,252 80
3/ 8/17	By St. Helens Creosoting Company	261 20
3/ 8/17	By Chas. R. McCormick	25 00
3/12/17	By Hercules Construction Company	3,028 41
3/13/17	By Healy-Tibbitts Construction Company	1,398 81
3/14/17	By Chas. R. McCormick & Company	10 00
3/14/17	By J. M. Colman Company	8,073 75
3/14/17	By Pope & Talbot	40 00
3/16/17	By Blake Bros. Company	7,594 02
3/19/17	By F. W. Richardson, State Treasurer	6,925 42
3/21/17	By Pope & Talbot	40 00
3/21/17	By Bashford Smith	36 08
3/21/17	By Healy-Tibbitts Construction Company	2,528 00
3/21/17	By J. Eugene Stevens	14 10
3/22/17	By Western Fuel Company	3 12
3/26/17	By Robt. W. Hunt & Company	210 96
3/29/17	By Blake Bros. Company	51 00
3/29/17	By Chas. R. McCormick & Company	3,466 33
4/ 4/17	By St. Helens Creosoting Company	1,750 96
4/11/17	By Clinton Construction Company	282 53
4/11/17	By J. M. Colman Company	9,984 31
4/11/17	By Clinton Construction Company	1,959 46
4/17/17	By Healy-Tibbitts Construction Company	1,398 80
4/17/17	By F. W. Richardson, State Treasurer	5,310 24
4/17/17	By J. M. Colman Company	2,691 25
4/20/17	By Western Electric Company	125 31
4/20/17	By Bashford Smith	26 44
4/24/17	By Blake Bros. Company	9,675 54
4/24/17	By Clinton Construction Company	5,399 50
4/24/17	By Central Coal Company	3 12
4/24/17	By George H. Tay Company	10 62
4/24/17	By Pacific Portland Cement Company Consolidated	5,789 20
4/26/17	By St. Helens Creosoting Company	1,155 44
5/ 3/17	By Robt. W. Hunt & Company	137 45
5/ 4/17	By Daniel L. Bienfield & Company	26 80
5/12/17	By Healy-Tibbitts Construction Company	14,540 64
5/14/17	By J. M. Colman Company	3,328 10
5/14/17	By Hercules Construction Company	622 00
5/16/17	By Blake Bros. Company	10,763 71
5/16/17	By Hercules Construction Company	690 69
5/21/17	By J. Eugene Stevens	20 65
5/22/17	By F. W. Richardson, State Treasurer	6,233 42
5/22/17	By Western Electric Company	285 57
5/22/17	By Geo. H. Tay Company	19 45
5/22/17	By Pacific Portland Cement Company Consolidated	11,660 40
5/31/17	By Holbrook, Merrill & Stetson	2 94
5/31/17	By D. Girdwood	15 00
6/ 8/17	By Blake Bros. Company	2,154 31
6/18/17	By Hercules Construction Company	1,771 00
6/21/17	By Drendell Electrical and Manufacturing Company	122 18
6/21/17	By George H. Tay Company	2 65
6/21/17	By Standard Underground Cable Company	141 50
6/21/17	By Western Electric Company	148 03
6/21/17	By Pacific Hardware and Steel Company	8 60
6/27/17	By F. W. Richardson, State Treasurer	642 51
6/28/17	By Westinghouse Lamp Company	226 37
	Total disbursements	$592,318 45
	Total balance	$616,340 88
	Total disbursements	592,318 45
	Total balance in fund	$24,022 43

State Highway Sinking Fund.

Transactions in the State Highway Sinking Fund during the Sixty-eighth Fiscal Year.

RECEIPTS.

Date	Items	Interest	Transfer of interest	Total
7/ 1/16	To amount brought forward			$1,644,200 00
7/ 1/16	To transfer from General Fund		$360,000 00	
6/ 8/17	To transfer from General Fund		360,000 00	
6/ 8/17	To transfer from General Fund, redemption bonds		400,000 00	1,120,000 00
	Totals		$1,120,000 00	$2,764,200 00

DISBURSEMENTS.

Date	Items	Interest paid	Total
7/ 1/16	By amounts brought forward		$1,644,200 00
12/11/16	By payment semiannual interest	$360,000 00	
6/ 9/17	By payment semiannual interest	360,000 00	720,000 00
	Totals	$720,000 00	$2,364,200 00
	Balance on hand in fund		400,000 00
			$2,764,200 00

State Highway Fund.

Transactions in the State Highway Fund during the Sixty-eighth Fiscal Year.

RECEIPTS.

Date	Items	Amount
7/ 1/16	To balance on hand	$1,500,847 23
7/15/16	To Department of Engineering	18 67
7/15/16	To Department of Engineering	842 15
7/17/16	To Department of Engineering	3,846 09
7/24/16	To Shasta County, donation	16,000 00
7/24/16	To Department of Engineering	162 51
7/25/16	To Department of Engineering	714 03
8/ 1/16	To Department of Engineering	5,000 00
8/ 9/16	To Department of Engineering	627 55
8/24/16	To Department of Engineering	105 24
8/21/16	To Sonoma County, donation	25,000 00
8/22/16	To Department of Engineering	400 85
9/ 7/16	To Department of Engineering	64 02
9/12/16	To Department of Engineering	12 58
9/14/16	To Department of Engineering	4,010 15
9/18/16	To Department of Engineering	280 81
9/20/16	To Department of Engineering	137 46
9/25/16	To Department of Engineering	305 16
9/27/16	To Department of Engineering	127 52
9/29/16	To Department of Engineering	192 53
10/ 9/16	To Department of Engineering	77 00
10/13/16	To Department of Engineering	2 50
10/23/16	To Department of Engineering	27
10/24/16	To Department of Engineering	1,816 37
10/27/16	To Department of Engineering	362 42
11/ 3/16	To Santa Barbara County, donation	1,179 12
11/ 3/16	To San Luis Obispo County, donation	5,000 00
11/ 8/16	To Department of Engineering	451 51
11/10/16	To Department of Engineering	465 58
11/11/16	To Department of Engineering	151 30
11/16/16	To Department of Engineering	3,424 63
11/24/16	To Department of Engineering	327 49
11/25/16	To Department of Engineering	112 72
12/ 1/16	To Department of Engineering	5,257 70
12/ 5/16	To Department of Engineering	244 31
12/12/16	To Department of Engineering	2 30
12/22/16	To Department of Engineering	55 50
1/ 2/17	To Department of Engineering	1,221 77
1/ 5/16	To Department of Engineering	3,822 80
1/10/17	To Department of Engineering	263 04
1/17/17	To Department of Engineering	50
1/17/17	To Department of Engineering	101 14
1/31/17	To Department of Engineering	50,000 00
2/ 7/17	To Department of Engineering	93
2/ 8/17	To Department of Engineering	2,166 14
2/16/17	To Calaveras County, donation	5,000 00
2/17/17	To Department of Engineering	21,066 18
2/23/17	To Department of Engineering	14 44
3/ 1/17	To Humboldt County, donation	80,992 63
3/ 6/17	To Department of Engineering	1,319 71
3/19/17	To Department of Engineering	5,311 84
3/28/17	To Siskiyou County, donation	45,345 33
3/31/17	To Department of Engineering	519 49
4/ 4/18	To Department of Engineering	24 00
4/ 9/17	To Department of Engineering	26,224 50
4/14/17	To Calaveras County, donation	5,000 00
4/27/17	To Department of Engineering	44 95
5/ 2/17	To Department of Engineering	122 58
5/26/17	To Treasurer Imperial County, donation	31,944 81
6/ 1/17	To Department of Engineering	1,239 65
6/13/17	To Department of Engineering	3 23
	Total	$1,859,374 96

State Highway Fund—Continued.

Transactions in the State Highway Fund during the Sixty-eighth Fiscal Year.

DISBURSEMENTS.

Date	Items	Amount
7/ 3/16	By Department of Engineering	$21,111 84
7/11/16	By Department of Engineering	1,468 86
7/11/16	By Department of Engineering	2,143 77
7/12/16	By Department of Engineering	53,481 87
7/14/16	By Department of Engineering	1,015 24
7/18/16	By Department of Engineering	103,320 15
7/20/16	By Department of Engineering	3,121 93
7/24/16	By Department of Engineering	53,788 17
7/27/16	By Department of Engineering	55 50
7/28/16	By Department of Engineering	2,767 95
7/29/16	By Department of Engineering	32,335 35
7/31/16	By Department of Engineering	4,388 26
8/ 7/16	By Department of Engineering	1,213 27
8/ 8/16	By Department of Engineering	21,733 49
8/17/16	By Department of Engineering	1,262 23
8/18/16	By Department of Engineering	120,316 63
8/28/16	By Department of Engineering	2,888 33
8/30/16	By Department of Engineering	2,742 33
9/ 6/16	By Department of Engineering	19,776 04
9/11/16	By Department of Engineering	81,843 07
9/12/16	By Department of Engineering	3,053 86
9/14/16	By Department of Engineering	27,791 77
9/16/16	By Department of Engineering	2,961 73
9/22/16	By Department of Engineering	2,893 36
9/26/16	By Department of Engineering	43,083 36
9/27/16	By Department of Engineering	17.048 97
10/ 2/16	By Department of Engineering	28,574 25
10/ 3/16	By Department of Engineering	2,813 33
10/ 7/16	By Department of Engineering	66,924 10
10/11/16	By Department of Engineering	2,509 82
10/13/16	By Department of Engineering	30,431 35
10/14/16	By Department of Engineering	2,707 82
10/17/16	By Department of Engineering	23,563 63
10/19/16	By Department of Engineering	95 45
10/20/16	By Department of Engineering	3,277 21
10/23/16	By Department of Engineering	37,061 66
10/27/16	By Department of Engineering	30,415 49
10/31/16	By Department of Engineering	50,748 25
11/ 1/16	By Department of Engineering	1,412 38
11/ 6/16	By Department of Engineering	31,729 68
11/ 8/16	By Department of Engineering	1,001 66
11/10/16	By Department of Engineering	15,376 24
11/14/16	By Department of Engineering	2,847 70
11/15/16	By Department of Engineering	45,863 18
11/21/16	By Department of Engineering	3,254 35
11/23/16	By Department of Engineering	38,223 48
11/27/16	By Department of Engineering	3,318 59
11/28/16	By Department of Engineering	7,119 11
11/29/16	By Department of Engineering	2,892 29
12/ 4/16	By Department of Engineering	39,770 05
12/ 7/16	By Department of Engineering	79,762 52
12/ 9/16	By Department of Engineering	2,531 16
12/19/16	By Department of Engineering	3,118 61
12/20/16	By Department of Engineering	29,500 67
12/21/16	By Department of Engineering	1,123 12
12/22/16	By Department of Engineering	69,124 54
12/27/16	By Department of Engineering	11,939 62
1/ 3/17	By Department of Engineering	43,348 26
1/ 6/17	By Department of Engineering	26,596 38
1/ 9/17	By Department of Engineering	2,920 87
1/12/17	By Department of Engineering	224 93
1/17/17	By Department of Engineering	101,400 05

State Highway Fund—Continued.

Transactions in the State Highway Fund during the Sixty-eighth Fiscal Year.

DISBURSEMENTS—Continued.

Date	Items	Amount
1/18/17	By Department of Engineering	$5,187 81
1/23/17	By Department of Engineering	2,236 74
1/25/17	By Department of Engineering	27,857 57
1/31/17	By Department of Engineering	1,845 85
2/ 1/17	By Department of Engineering	9,839 25
2/ 2/17	By Department of Engineering	17,831 77
2/ 7/17	By Department of Engineering	2,103 75
2/ 9/17	By transfer to Motor Vehicle Fund	1,179 12
2/10/17	By Department of Engineering	23,332 50
2/13/17	By Department of Engineering	22,321 54
2/14/17	By Department of Engineering	1,262 38
2/15/17	By Department of Engineering	1,545 11
2/17/17	By Department of Engineering	37,473 73
2/20/17	By Department of Engineering	393 84
2/23/17	By Department of Engineering	18 20
2/26/17	By Department of Engineering	1,768 53
2/27/17	By Department of Engineering	609 21
2/28/17	By Department of Engineering	6,195 37
3/10/17	By Department of Engineering	4,408 29
3/12/17	By Department of Engineering	32,896 85
3/14/17	By Department of Engineering	3,784 34
3/15/17	By Department of Engineering	959 93
3/16/17	By Department of Engineering	14,931 61
3/20/17	By Department of Engineering	2,111 89
3/21/17	By Department of Engineering	2,051 97
3/24/17	By Department of Engineering	13,015 92
3/27/17	By Department of Engineering	2,402 13
3/28/17	By Department of Engineering	170 60
3/29/17	By Department of Engineering	31,116 80
3/31/17	By Department of Engineering	9 37
4/ 2/17	By Department of Engineering	2,644 49
4/ 4/17	By Department of Engineering	1,988 47
4/11/17	By Department of Engineering	28,530 76
4/17/17	By Department of Engineering	2,844 73
4/21/17	By Department of Engineering	3,505 38
4/24/17	By Department of Engineering	20,634 26
4/26/17	By Department of Engineering	3,349 83
4/30/17	By Department of Engineering	12,503 06
5/ 4/17	By Department of Engineering	2,330 03
5/ 8/17	By Department of Engineering	4,874 13
5/ 9/17	By Department of Engineering	9 37
5/16/17	By Department of Engineering	662 86
6/11/17	By Department of Engineering	5,150 65
6/13/17	By Department of Engineering	469 57
6/21/17	By Department of Engineering	22,751 68
6/28/17	By Department of Engineering	227 31
	Total	$1,854,467 08
	Balance on hand in fund	4,907 88
	Total	$1,859,374 96

University of California Building Fund.

Transactions in the University of California Building Fund for the Sixty-eighth Fiscal Year.

RECEIPTS.

Date	Items	Amount
7/ 1/16	To balance on hand	$1,568,008 80

DISBURSEMENTS.

Date	Items	**Amount**
7/ 6/16	By Regents University of California	$21,203 05
7/14/16	By Regents University of California	1,802 25
7/21/16	By Regents University of California	49,059 00
7/21/16	By Regents University of California	6,427 51
7/25/16	By Regents University of California	4,020 50
8/ 4/16	By Regents University of California	12 985 00
8/17/16	By Regents University of California	20,368 50
8/26/16	By Regents University of California	2,728 42
8/26/16	By Regents University of California	196 80
8/26/16	By Regents University of California	431 75
8/26/16	By Regents University of California	20 92
8/26/16	By Regents University of California	200 65
8/26/16	By Regents University of California	27,713 79
8/26/16	By Regents University of California	32,175 11
8/26/16	By Regents University of California	236 59
10/14/16	By Regents University of California	28,173 03
10/17/16	By Regents University of California	51,848 05
10/17/16	By Regents University of California	14,764 87
10/17/16	By Regents University of California	5,058 55
10/17/16	By Regents University of California	110 23
10/17/16	By Regents University of California	18,410 55
10/17/16	By Regents University of California	8.327 16
10/24/16	By Regents University of California	27,646 71
10/24/16	By Regents University of California	50,803 88
10/28/16	By Regents University of California	20,632 15
10/28/16	By Regents University of California	4,685 79
11/13/16	By Regents University of California	2,389 93
11/27/16	By Regents University of California	29,507 53
11/27/16	By Regents University of California	28,961 77
11/27/16	By Regents University of California	8,305 24
11/27/16	By Regents University of California	19,715 65
12/ 5/16	By Regents University of California	395 76
12/19/16	By Regents University of California	4,044 97
12/19/16	By Regents University of California	27,928 03
12/19/16	By Regents University of California	33,665 67
12/22/16	By Regents University of California	7,635 18
12/22/16	By Regents University of California	18,922 82
1/ 6/17	By Regents University of California	57,727 39
1/ 9/17	By Regents University of California	24,312 45
1/16/17	By Regents University of California	34,587 00
1/16/17	By Regents University of California	27,876 91
1/16/17	By Regents University of California	11,867 82
1/16/17	By Regents University of California	14,262 84
1/19/17	By Regents University of California	26,733 98
2/13/17	By Regents University of California	14,027 96
2/13/17	By Regents University of California	3,174 76
2/13/17	By Regents University of California	1,000 47
2/13/17	By Regents University of California	4,040 38
2/17/17	By Regents University of California	44,468 02
2/17/17	By Regents University of California	289 05
3/14/17	By Regents University of California	13,630 01
3/14/17	By Regents University of California	25,329 67
3/14/17	By Regents University of California	8,483 51

University of California Building Fund—Continued.

Transactions in the University of California Building Fund for the Sixty-eighth Fiscal Year.

DISBURSEMENTS—Continued.

Date	Items	Amount
3/19/17	By Regents University of California	$22,384 59
3/21/17	By Regents University of California	9,478 77
4/13/17	By Regents University of California	1,034 73
4/13/17	By Regents University of California	577 93
4/13/17	By Regents University of California	11,946 41
4/13/17	By Regents University of California	9,923 21
4/13/17	By Regents University of California	34,961 26
4/13/17	By Regents University of California	22,782 33
5/ 2/17	By Regents University of California	15,038 83
5/ 2/17	By Regents University of California	12,083 71
5/ 2/17	By Regents University of California	663 15
5/ 2/17	By Regents University of California	19,370 47
5/ 2/17	By Regents University of California	1,221 24
5/ 8/17	By Regents University of California	60 01
5/14/17	By Regents University of California	23,536 54
5/17/17	By Regents University of California	9,556 88
5/18/17	By Regents University of California	1,980 21
6/ 7/17	By Regents University of California	6.677 99
6/ 1/17	By Regents University of California	14,788 05
6/ 7/17	By Regents University of California	6,711 29
6/ 7/17	By Regents University of California	25,817 33
6/21/17	By Regents University of California	16,135 95
6/21/17	By Regents University of California	1,524 98
6/21/17	By Regents University of California	12,825 06
6/25/17	By Regents University of California	1,937 31
6/25/17	By Regents University of California	47,398 96
6/25/17	By Regents University of California	21,067 15
6/25/17	By Regents University of California	385 12
6/25/17	By Regents University of California	8,437 01
6/25/17	By Regents University of California	261 57
6/25/17	By Regents University of California	277 25
	Total	$1,264,220 87
	Balance on hand in fund	303,787 93
		$1,568,008 80

University of California Building Sinking Fund.

Transactions in the University of California Building Sinking Fund during the Sixty-eighth Fiscal Year.

RECEIPTS.

Date	Items	Interest	Transfer of interest	Total
7/ 1/16	To amounts brought forward	$25,650 00	$55,350 00	$81,000 00
12/11/16	To transfer from General Fund		40,500 00	
6/ 8/17	To transfer from General Fund		40,500 00	81,000 00
	Totals	$25,650 00	$136,350 00	$162,000 00

DISBURSEMENTS.

Date	Items	Interest paid	Total
7/ 1/16	By amounts brought forward		$81,000 00
12/11/16	By payment semiannual interest	$40,500 00	
6/ 9/17	By payment semiannual interest	40,500 00	81,000 00
	Totals	$81,000 00	$162,000 00

San Francisco State Building Fund.

Transactions in the San Francisco State Building Fund during the Sixty-eighth Fiscal Year.

RECEIPTS.

Date	Items	Amount
7/ 1/16	To balance on hand	$999,893 18

DISBURSEMENTS.

Date	Items	Amount
7/ 3/16	By Department of Engineering	$5 22
7/31/16	By Department of Engineering	100 12
9/ 6/16	By Department of Engineering	121 16
9/ 6/16	By Department of Engineering	6 00
9/14/16	By Department of Engineering	214 38
9/26/16	By Department of Engineering	32 82
10/ 2/16	By Department of Engineering	15 36
10/31/16	By Department of Engineering	189 63
11/ 6/16	By Department of Engineering	4 28
11/14/16	By Department of Engineering	26 46
12/ 7/16	By Department of Engineering	9 38
12/20/16	By Department of Engineering	10 98
12/20/16	By Department of Engineering	5 25
12/27/16	By Department of Engineering	126 81
1/ 6/17	By Department of Engineering	17 50
1/17/17	By Department of Engineering	18 00
1/17/17	By Department of Engineering	1,615 66
1/17/17	By Department of Engineering	13 12
1/25/17	By Department of Engineering	3 30
3/12/17	By Department of Engineering	24 40
3/12/17	By Department of Engineering	8,500 00
3/24/17	By Department of Engineering	7 25
3/24/17	By Department of Engineering	40 10
3/29/17	By Department of Engineering	117 72
4/11/17	By Department of Engineering	14 00
4/24/17	By Department of Engineering	1 50
4/21/17	By Department of Engineering	11 50
4/24/17	By Department of Engineering	154 66
5/16/17	By Department of Engineering	4,500 00
6/28/17	By Department of Engineering	18 97
	Total	$15,925 53
	Balance on hand in fund	983,967 65
		$999,893 18

San Francisco State Building Sinking Fund.

Transactions in the San Francisco State Building Sinking Fund during the Sixty-eighth Fiscal Year.

RECEIPTS.

Date	Items	Interest	Transfer of interest	Total
7/ 1/16	To amounts brought forward	$4,258 89	$35,741 11	$40,000 00
12/11/16	To transfer from General Fund, interest		19,600 00	
6/ 8/17	To transfer from General Fund, interest		19,600 00	
6/ 8/17	To transfer from General Fund, redemption bonds		20,000 00	59,200 00
	Totals	$4,258 89	$94,941 11	$99,200 00

DISBURSEMENTS.

Date	Items	Interest paid	Total
7/ 1/16	By amounts brought forward		$40,000 00
12/11/16	By payment semiannual interest	$19,600 00	
6/ 9/17	By payment semiannual interest	19,600 00	
6/ 9/17	By redemption of bonds	20,000 00	59,200 00
	Totals	$59,200 00	$99,200 00

Third San Francisco Seawall Fund.

Transactions in the Third San Francisco Seawall Fund during the Sixty-eighth Fiscal Year.

RECEIPTS.

Date	Items	Amount
2/ 5/17	To 1,000 San Francisco Harbor Improvement bonds sold to Torrance Marshall & Co. and R. M. Grant	$1,000,000 00
2/ 5/17	To premium on above bonds	47,750 00
	Total	$1,047,750 00

DISBURSEMENTS.

Date	Items	Amount
4/17/17	By F. W. Richardson, State Treasurer	$245 01
4/24/17	By Pacific Portland Cement Co., Cons.	852 80
5/12/17	By Healy-Tibbitts Construction Co.	26,424 00
5/12/17	By J. D. Hannah	11,160 00
5/16/17	By Clinton Construction Co.	3,921 75
5/16/17	By Clinton Construction Co.	19,612 50
5/21/17	By Hammond Lumber Co.	402 50
5/22/17	By F. W. Richardson, State Treasurer	1,451 62
5/22/17	By Bashford Smith	9 24
5/22/17	By Pacific Portland Cement Co., Cons.	475 60
5/29/17	By Healy-Tibbitts Construction Co.	84 20
5/31/17	By Blake Bros. Co.	62 00
6/18/17	By Healy-Tibbitts Construction Co.	2,275 50
6/18/17	By J. D. Hannah	7,440 00
6/20/17	By Healy-Tibbitts Construction Co.	11,010 00
6/21/17	By Clinton Construction Co.	39,225 00
6/21/17	By The A. Lietz Co.	3 15
6/21/17	By Pacific Portland Cement Co., Cons.	7,043 80
6/21/17	By John A. Roeblings Sons Co.	7 94
6/21/17	By Jim Wilder	13 75
6/21/17	By Hammond Lumber Co.	330 96
6/23/17	By The Frederick Post Co.	13 50
6/25/17	By Bashford Smith	5 28
6/27/17	By F. W. Richardson, State Treasurer	8,416 19
	Total	$140,486 29
	Balance on hand in fund	907,263 71
		$1,047,750 00

Third San Francisco Seawall Sinking Fund.

Transactions in the Third San Francisco Seawall Sinking Fund during the Sixty-eighth Fiscal Year.

RECEIPTS.

Date	Items	Interest	Transfer of interest	Total
2/ 5/17	To accrued interest received from sale of bonds	$3,388 88		
3/ 1/17	To transfer from S. F. Harbor Imp. Fund		$3,277 80	
4/ 2/17	To transfer from S. F. Harbor Imp. Fund		3,333 33	
5/ 2/17	To transfer from S. F. Harbor Imp. Fund		3,333 33	
6/ 1/17	To transfer from S. F. Harbor Imp. Fund		3,333 33	
6/ 8/17	To transfer from General Fund		3,333 33	$20,000 00
	Totals	$3,388 88	$16,611 12	$20,000 00

DISBURSEMENTS.

Date	Items	Interest paid	Total
6/ 9/17	By payment of semiannual interest	$20,000 00	$20,000 00
		$20,000 00	$20,000 00

India Basin Fund.

Transactions in the India Basin Fund during the Sixty-eighth Fiscal Year.

RECEIPTS.

Date	Items	Amount
4/26/17	To 625 India Basin bonds sold to State Board of Control	$625,000 00
	Total	$625,000 00

DISBURSEMENTS.

Date	Items	Amount
5/16/17	By H. I. Mulcrecy, Clerk City and County of San Francisco, ex officio Clerk Supreme Court	$601,431 80
6/28/17	By H. I. Mulcrevy, Clerk City and County of San Francisco, ex officio Clerk Supreme Court	10,000 00
	Total	$611,431 80
	Balance on hand in fund	13,568 20
	Total	$625,000 00

India Basin Sinking Fund.

Transactions in the India Basin Sinking Fund during the Sixty-eighth Fiscal Year.

RECEIPTS.

Date	Items	Interest	Transfer of interest	Total
4/26/17	To accrued interest from sale of bonds	$7,777 78		
5/ 1/17	To transfer from S. F. Harbor Imp. Fund		$555 56	
6/ 1/17	To transfer from S. F. Harbor Imp. Fund		2,083 33	
6/ 8/17	To transfer from S. F. Harbor Imp. Fund		2,083 33	$12,500 00
	Totals	$7,777 78	$4,722 22	$12,500 00

DISBURSEMENTS.

Date	Items	Interest paid	Total
6/ 9/17	By payment of semiannual interest	$12,500 00	$12,500 00
	Totals	$12,500 00	$12,500 00

Estates of

Transactions in Bonds Purchased by the Estates of Deceased Persons Fund, and Collection of Interest Thereon for

Title and classification of bonds	Rate of interest	Value of each bond	On hand July 1, 1916	
			Number of bonds	Total value
Anaheim School District	5	$2,000 00	10	$20,000 00
Cerritos School District	5	250 00		
Coalinga Union High School	6	500 00	25	12,500 00
Dixie Land School District	6	500 00	14	7,000 00
Dunsmuir Municipal Improvement	6	250 00	88	22,000 00
Glendora School District	5	1,000 00		
Graham School District	5	1,000 00	25	25,000 00
Indian Falls School District	6	100 00	30	3,000 00
Laguna School District	6	250 00	9	2,250 00
Lincoln Union High School	5	1,000 00	14	14,000 00
Long Beach School District	5	1,000 00	30	30,000 00
Los Angeles City High School District	4	1,000 00	128	128,000 00
Marysville School District	4½	1,000 00	19	19,000 00
Newport Beach Municipal Improvement	5	1,000 00	34	34,000 00
Pomona City School District	5	1,000 00		
Portola School District	6	500 00	8	4,000 00
Russell School District	5½	250 00	5	1,250 00
San Francisco Street Railway	5	1,000 00	3	3,000 00
San Jacinto High School	5	1,000 00	25	25,000 00
Santa Maria Municipal Improvement	5	1,000 00	25	25,000 00
Tehama Municipal Improvement	6	500 00	19	9,500 00
Washington School District	5	1,000 00		
San Francisco Street Railway	5	1,000 00	1	1,000 00
San Francisco Street Railway	5	500 00	1	500 00
			513	$386,000 00

Deceased Persons Fund.

Held in Trust by the State Treasurer for Benefit of the State School Fund, and the Sixty-eighth Fiscal Year.

Purchased		Redeemed		Balance on hand June 30, 1917		Interest collected		
Number of bonds	Total value	Number of bonds	Total value	Number of bonds	Total value	Gross	Paid into school fund	Paid into estates of deceased persons fund
--------	--------	1	$2,000 00	9	$18,000 00	$1,000 00	--------	$1,000 00
37	$9,250 00	1	250 00	36	9,000 00	231 25	$231 25	--------
--------	--------	5	2,500 00	20	10,000 00	750 00	--------	750 00
--------	--------	--------	--------	14	7,000 00	420 00	--------	420 00
--------	--------	5	1,250 00	83	20,750 00	1,320 00	--------	1,320 00
36	36,000 00	2	2,000 00	34	34,000 00	900 00	900 00	--------
--------	--------	1	1,000 00	24	24,000 00	1,250 00	--------	1,250 00
--------	--------	--------	--------	30	3,000 00	180 00	--------	180 00
--------	--------	1	250 00	8	2,000 00	135 00	--------	135 00
--------	--------	1	1,000 00	13	13,000 00	700 00	--------	700 00
--------	--------	--------	--------	30	30,000 00	1,500 00	--------	1,500 00
--------	--------	--------	--------	128	128,000 00	5,120 00	--------	5,120 00
--------	--------	2	2,000 00	17	17,000 00	810 00	--------	810 00
--------	--------	1	1,000 00	33	33,000 00	1,700 00	--------	1,700 00
21	21,000 00	--------	--------	21	21,000 00	--------	--------	--------
--------	--------	1	500 00	7	3,500 00	225 00	--------	225 00
--------	--------	--------	--------	5	1,250 00	34 38	34 38	--------
--------	--------	3	3,000 00	--------	--------	75 00	25 58	49 42
--------	--------	--------	--------	25	25,000 00	1,250 00	--------	1,250 00
--------	--------	--------	--------	25	25,000 00	1,250 00	--------	1,250 00
--------	--------	1	500 00	18	9,000 00	570 00	6 29	563 71
30	30,000 00	--------	--------	30	30,000 00	--------	--------	--------
--------	--------	--------	--------	1	1,000 00	50 00	--------	50 00
--------	--------	--------	--------	1	500 00	25 00	--------	25 00
124	$96,250 00	25	$17,250 00	612	$465,000 00	$19,495 63	$1,197 50	$18,298 13

State Compensation

Transactions in Bonds Purchased by the Industrial Accident Commission, and Held Fund, and Collections of Interest Thereon

Title and classification of bonds	Rate of interest	Amount of each bond	On hand July 1, 1916	
			Number of bonds	Total value
Benicia School District	5	$1,000 00	16	$16,000 00
Ceres High School District	5	1,000 00	35	35,000 00
Compton Sewer	5½	1,000 00	40	40,000 00
Compton Sewer	5½	750 00	40	30,000 00
Corona Street Improvement	5	912 50	36	32,850 00
Daly City Water Works	5½	1,000 00	90	90,000 00
Eagle Rock Water Works	5	1,000 00	--------	------------
El Monte Water Works	6	500 00	35	17,500 00
El Monte Water Works	6	250 00	35	8,750 00
Esperanza School District	6	250 00	15	3,750 00
Flowery School District	6	400 00	10	4,000 00
Freeport School District	5	500 00	--------	------------
Hanford Municipal Improvement	5	1,000 00	74	74,000 00
Hermosa Beach Municipal Improvement	5½	666 66⅔	14	9,333 33⅔
Hermosa Beach Municipal Improvement	5½	333 33⅓	14	4,666 66⅓
Hughson School District	5	1,000 00	10	10,000 00
Hughson School District	5	1,000 00	10	10,000 00
Independent School District	6	500 00	--------	------------
Kingsburg Joint Union High	6	1,000 00	40	40,000 00
La Canada School District	5	1,000 00	--------	------------
Larkspur School District	5	1,000 00	8	8,000 00
Lompoc Municipal Improvement	5	1,000 00	--------	------------
Newport Beach Municipal Improvement	5	1,000 00	23	23,000 00
North Sacramento School District	5	500 00	50	25,000 00
Oasis School District	6	250 00	8	2,000 00
Orange City Municipal Improvement	5	500 00	19	9,500 00
Napa City Municipal Improvement	5	1,000 00	25	25,000 00
Orland Municipal Improvement	5	1,000 00	11	11,000 00
Orland Municipal Improvement	5	500 00	19	9,500 00
Palo Alto Subway	5	237 50	39	9,262 50
Placentia-Richfield School District	5	1,500 00	--------	------------
Randolph School District	5	1,000 00	66	66,000 00
Rio Vista Joint Union High School District	5	1,000 00	56	56,000 00
Riverbank School District	6	500 00	18	9,000 00
San Anselmo School District	5	1,000 00	18	18,000 00
Sausalito Municipal Improvement	5	1,000 00	24	24,000 00
Sausalito Municipal Improvement	5	500 00	12	6,000 00
State of California Highway	4	1,000 00	--------	------------
Terminus School District	6	300 00	5	1,500 00
Wilson School District	6	400 00	7	2,800 00
Totals	--------	------------	922	$731,412 50

Insurance Fund.

in Trust by the State Treasurer for the Benefit of the State Compensation Insurance for the Sixty-eighth Fiscal Year.

Purchased		Redeemed		Number of bonds	Balance on hand June 30, 1917	Interest collected		
Number of bonds	Total value	Number of bonds	Total value			Gross	Paid into school fund	State Compensation Insurance Fund
--------	------------	1	$1,000 00	15	$15,000 00	$800 00	------------	$800 00
--------	------------	--------	------------	35	35,000 00	1,750 00	------------	1,750 00
--------	------------	1	1,000 00	39	39,000 00	3,801 88	------------	3,801 88
--------	------------	1	750 00	39	29,250 00			
--------	------------	1	912 50	35	31,937 50	1,642 50	------------	1,642 50
--------	------------	--------	------------	90	90,000 00	4,950 00	------------	4,950 00
70	70,000 00	--------	------------	70	70,000 00	------------	------------	------------
--------	------------	--------	------------	35	17,500 00	1,050 00	------------	1,050 00
--------	------------	--------	------------	35	8,750 00	525 00	------------	525 00
--------	------------	1	250 00	14	3,500 00	225 00	------------	225 00
--------	------------	1	400 00	9	3,600 00	240 00	------------	240 00
15	7,500 00	--------	------------	15	7,500 00	375 00	------------	375 00
--------	------------	2	2,000 00	72	72,000 00	3,650 00	------------	3,650 00
--------	------------	1	666 66⅔	13	8,633 66⅔	770 00	------------	770 00
--------	------------	1	333 33⅓	13	4,333 33⅓			
--------	------------	--------	------------	10	10,000 00	500 00	------------	500 00
--------	------------	--------	------------	10	10,000 00	500 00	------------	500 00
8	4,000 00	--------	------------	8	4,000 00	120 00	------------	120 00
--------	------------	--------	------------	40	40,000 00	2,400 00	------------	2,400 00
25	25,000 00	--------	------------	25	25,000 00	1,250 00	------------	1,250 00
--------	------------	1	1,000 00	7	7,000 00	400 00	------------	400 00
55	55,000 00	--------	------------	55	55,000 00	1,375 00	------------	1,375 00
--------	------------	1	1,000 00	22	22,000 00	1,150 00	------------	1,150 00
--------	------------	2	1,000 00	48	24,000 00	1,250 00	------------	1,250 00
--------	------------	1	250 00	7	1,750 00	120 00	------------	120 00
--------	------------	1	500 00	18	9,000 00	462 50	------------	462 50
--------	------------	--------	------------	25	25,000 00	1,250 00	------------	1,250 00
--------	------------	1	1,000 00	10	10,000 00	850 00	------------	850 00
--------	------------	2	1,000 00	18	8,500 00			
--------	------------	1	237 50	38	9,025 00	463 32	------------	463 32
20	30,000 00	--------	------------	20	30,000 00	750 00	------------	750 00
--------	------------	3	3,000 00	63	63,000 00	3,350 00	------------	3,350 00
--------	------------	2	2,000 00	54	54,000 00	2,800 00	------------	2,800 00
--------	------------	2	1,000 00	16	8,000 00	540 00	------------	540 00
--------	------------	1	1,000 00	17	17,000 00	900 00	------------	900 00
--------	------------	--------	------------	24	24,000 00	1,200 00	------------	1,200 00
--------	------------	--------	------------	12	6,000 00	300 00	------------	300 00
350	350,000 00	--------	------------	350	350,000 00	------------	------------	------------
--------	------------	--------	1,300 00	4	1,200 00	90 00	------------	90 00
--------	------------	--------	------------	7	2,800 00	168 00	------------	168 00
543	$541,500 00	29	$20,600 00	1,386	$1,252,312 50	$41,968 20	------------	$41,968 20

State School

Transactions in Bonds Purchased by the State School Land Fund, and Held in Collections of Interest Thereon for

Title and classification of bonds	Rate of interest	Value of each bond	On hand July 1, 1916	
			Number of bonds	Total value
State of California Funded Debt of 1873	6	Various	150	$1,526,500 00
State of California Highways	4	1,000 00	100	100,000 00
Counties.				
Kern	4½	1,000 00	51	51,000 00
Lake	5	500 00	40	20,000 00
Mendocino	4	500 00	120	60,000 00
Merced	4	1,000 00	1	1,000 00
Monterey	4	1,000 00	35	35,000 00
Plumas	4	1,000 00	100	100,000 00
Riverside	4	1,000 00	135	135,000 00
San Benito	4½	1,000 00	18	18,000 00
School Districts.				
Anaheim Union High	5	1,000 00	53	53,000 00
Arden	5	500 00	18	9,000 00
Bakersfield	5	1,000 00	37	37,000 00
Belvedere	4½	500 00	9	9,000 00
Brawley Union High	5	500 00	100	50,000 00
Brawley	6	2,500 00	7	17,500 00
Capital	4½	1,000 00	32	32,000 00
Chino High	5	2,000 00	13	26,000 00
Cloverdale	5	1,000 00		
Compton	5	1,000 00	13	13,000 00
Corona	5	1,000 00	30	30,000 00
Covina Union High	5	1,000 00	60	60,000 00
Del Paso Heights	5	500 00	24	12,000 00
Dixon	5	1,000 00	20	20,000 00
Duarte	5	1,000 00	12	12,000 00
El Monte Union High	5	1,000 00		
Eureka	4½	1,000 00	8	8,000 00
Fairoaks	5	500 00	6	300 00
Fortuna High	5	800 00	30	24,000 00
Galt Joint Union High	6	1,000 00	47	47,000 00
Healdsburg	4	1,750 00	9	15,750 00
Hermosa Beach	5	1,000 00	20	20,000 00
Hudson	5	1,000 00	4	4,000 00
Huntington Park Union High	5	1,000 00	63	63,000 00
Huntington Park Union High	5	1,000 00	15	15,000 00
Jackson Joint Union High	5	500 00	46	23,000 00
Jefferson	5	2,250 00	17	38,250 00
Larkspur	5	500 00		
Lincoln	6	300 00		
Long Beach	5	1,000 00		
Los Angeles City	4½	1,000 00		
Los Angeles City	3¾	1,000 00	324	324,000 00
Los Angeles City	4	1,000 00	22	22,000 00
Madera	5	1,000 00	5	5,000 00
Madera	5	1,500 00	10	15,000 00
Madera	5	2,000 00	10	20,000 00
Madera	5	3,000 00	10	30,000 00
Modesto	5	1,000 00	32	32,000 00
New England Mills	5	200 00		
Oakdale Union High	5	500 00	30	15,000 00
Oakland	4	1,000 00	232	232,000 00
Pacific	5	500 00	12	6,000 00
Palmdale	5	500 00		
Pasadena	4	1,000 00	44	44,000 00
Perris Union High	5	1,000 00	20	20,000 00
Pomona	4	750 00	27	20,250 00
Pomona High	4	2,750 00	7	19,250 00
Pomona	4½	1,000 00	68	68,000 00

Land Fund.

Trust by the State Treasurer for the Benefit of the State School Fund, and the Sixty-eighth Fiscal Year.

Purchased		Redeemed		Balance on hand June 30, 1917		Amount of interest collected		
Number of bonds	Total value	Number of bonds	Total value	Number of bonds	Total value	Gross	Paid into school fund	Paid into school land fund
--------	------------	--------	------------	150	$1,526 500 00	$91,500 00	$91,500 00	------------
--------	------------	--------	------------	100	100,000 00	------------	------------	------------
--------	------------	23	$23,000 00	28	28,000 00	1,777 50	1,777 50	------------
--------	------------	2	1,000 00	38	19,000 00	1,000 00	1,000 00	------------
--------	------------	5	2,500 00	115	57,500 00	2,350 00	2,350 00	------------
--------	------------	1	1,000 00	--------	------------	40 00	40 00	------------
--------	------------	7	7,000 00	28	28,000 00	1,400 00	1,400 00	------------
--------	------------	--------	------------	100	100,000 00	4,000 00	4,000 00	------------
--------	------------	5	5,000 00	130	130,000 00	5,300 00	5,300 00	------------
--------	------------	3	3,000 00	15	15,000 00	810 00	810 00	------------
--------	------------	4	4,000 00	49	49,000 00	2,650 00	2,650 00	------------
--------	------------	--------	------------	18	9,000 00	450 00	450 00	------------
--------	------------	9	9,000 00	28	28,000 00	1,850 00	1,850 00	------------
--------	------------	1	1,000 00	8	8,000 00	405 00	405 00	------------
--------	------------	--------	------------	100	50,000 00	2,500 00	2,500 00	------------
--------	------------	1	2,500 00	6	15,000 00	975 00	975 00	------------
--------	------------	1	1,000 00	31	31,000 00	1,440 00	1,440 00	------------
--------	------------	1	2,000 00	12	24,000 00	1,300 00	1,300 00	------------
29	$29,000 00	--------	------------	29	29,000 00	------------	------------	------------
--------	------------	1	1,000 00	12	12,000 00	650 00	650 00	------------
--------	------------	--------	------------	30	30,000 00	1,500 00	1,500 00	------------
--------	------------	--------	------------	60	60,000 00	3,000 00	3,000 00	------------
--------	------------	1	500 00	23	11,500 00	600 00	600 00	------------
--------	------------	1	1,000 00	19	19,000 00	975 00	975 00	------------
--------	------------	1	1,000 00	11	11,000 00	600 00	600 00	------------
15	15,000 00	--------	------------	15	15,000 00	------------	------------	------------
--------	------------	1	1,000 00	7	7,000 00	360 00	360 00	------------
--------	------------	1	500 00	5	2,500 00	150 00	150 00	------------
--------	------------	--------	------------	30	24,000 00	1,200 00	------------	$1,200 00
--------	------------	2	2,000 00	45	45,000 00	2,760 00	2,760 00	------------
--------	------------	1	1,750 00	8	14,000 00	630 00	630 00	------------
--------	------------	1	1,000 00	19	19,000 00	1,000 00	1,000 00	------------
--------	------------	1	1,000 00	3	3,000 00	200 00	200 00	------------
--------	------------	2	2,000 00	61	61,000 00	3,150 00	3,150 00	------------
--------	------------	--------	------------	15	15,000 00	750 00	750 00	------------
--------	------------	2	1,000 00	44	22,000 00	1,150 00	1,150 00	------------
--------	------------	--------	------------	17	38,250 00	1,912 50	1,912 50	------------
10	5,000 00	--------	------------	10	5,000 00	------------	------------	------------
9	2,700 00	--------	------------	9	2,700 00	------------	------------	------------
110	110,000 00	--------	------------	110	110,000 00	------------	------------	------------
204	204,000 00	--------	------------	204	204,000 00	------------	------------	------------
--------	------------	12	12,000 00	312	312 000 00	12,150 00	12,150 00	------------
--------	------------	--------	------------	22	22,000 00	880 00	880 00	------------
--------	------------	1	1,000 00	4	4,000 00	3,475 00	3,475 00	------------
--------	------------	--------	------------	10	15,000 00			
--------	------------	--------	------------	10	20,000 00			
--------	------------	--------	------------	10	30,000 00			
--------	------------	--------	------------	32	32,000 00	1,600 00	1,600 00	------------
20	4,000 00	--------	------------	20	4,000 00	100 00	------------	100 00
--------	------------	3	1,500 00	27	13,500 00	750 00	750 00	------------
--------	------------	8	8,000 00	224	224,000 00	9,120 00	9,120 00	------------
--------	------------	1	500 00	11	5,500 00	300 00	300 00	------------
35	17,500 00	--------	------------	35	17,500 00	------------	------------	------------
--------	------------	2	2 000 00	42	42,000 00	1,760 00	1,760 00	------------
--------	------------	1	1,000 00	19	19,000 00	1,000 00	1,000 00	------------
--------	------------	1	750 00	26	19,500 00	810 00	810 00	------------
--------	------------	1	2,750 00	6	16,500 00	770 00	770 00	------------
--------	------------	2	2,000 00	63	63,000 00	3,060 00	3,060 00	------------

State School Land

Transactions in Bonds Purchased by the State School Land Fund, and Held in
Collections of Interest Thereon for

Title and classification of bonds	Rate of interest	Value of each bond	On hand July 1, 1916	
			Number of bonds	Total value
Pomona	4½	$500 00	10	$5,000 00
Porterville High	5	1,250 00	8	10,000 00
Porterville	5	1,000 00	19	19,000 00
Porterville	5	1,500 00	27	40,500 00
Redlands, Laguna and Crafton High	5	4,000 00	7	28,000 00
Round Valley	6	500 00	--------	------------
Roeding	5	1,000 00	2	2,000 00
Sacramento High School	4	1,000 00	36	36,000 00
San Dimas	5	500 00	--------	------------
San Jose	4	1,000 00	180	180,000 00
San Jose High	4	1,000 00	103	103,000 00
San Mateo Union High School	4½	1,000 00	82	82,000 00
San Rafael	5	1,000 00	26	26,000 00
San Rafael High	5	1,000 00	8	8,000 00
San Bernardino	4½	1,000 00	15	15,000 00
Santa Clara	5	750 00	74	55,500 00
Selma Union High	5	1,000 00	45	45,000 00
South Pasadena	5	1,500 00	36	54,000 00
Stone	5	500 00	9	4,500 00
Sutter	5	500 00	14	7,000 00
Turlock	5	1,000 00	56	56 000 00
Walnut Grove	5	300 00	10	3,000 00
Willow Springs	5	500 00	--------	------------
Winters Joint Union High	5	1,000 00	30	30,000 00
Irrigation Districts.				
South San Joaquin	5	500 00	100	50,000 00
Municipalities.				
Antioch Sewer	5	400 00	8	3,200 00
Antioch Water	5	1,000 00	10	10,000 00
Bakersfield	5	500 00	14	7,000 00
Bakersfield Municipal Improvement	5	1,000 00	37	37 000 00
Bakersfield Municipal Improvement	4	1,000 00	11	11 000 00
Bakersfield Fire Department	5	500 00	23	11 500 00
Bakersfield Library	5	675 00	37	24,975 00
Belvedere Street	5	500 00	29	14,500 00
Belvedere Street	4½	500 00	53	26 500 00
Bishop Municipal Improvement	5	500 00	58	29,000 00
Bishop Municipal Improvement	6	550 00	58	31,900 00
Colton Municipal Improvement	5	1,000 00	53	53,000 00
Corning Water	5	600 00	39	23 400 00
Corning Sewer	5	500 00	12	6,000 00
El Centro Sewer	5	1,000 00	26	26,000 00
Escondido Municipal Improvement	5	1 000 00	67	67,000 00
Escondido Municipal Improvement	5	333 33	24	7,999 92
Fairfield Sewer	5	500 00	32	16 000 00
Fullerton Municipal Improvement	5	1,000 00	74	74,000 00
Fullerton Municipal Improvement	5	500 00	91	45,500 00
Fullerton Municipal Improvement	5	300 00	15	4,500 00
Inglewood City Municipal Improvement	5	500 00	54	27,000 00
Inglewood City Municipal Improvement	5½	500 00	8	4,000 00
Hermosa Beach Municipal Improvement	5	1,000 00	37	37,000 00
Hermosa Beach Municipal Improvement	5	500 00	37	18,500 00
Huntington Beach Municipal Improvement	5½	250 00	252	63,000 00
Lemoore Beach Municipal Improvement	5	500 00	27	13,500 00
Livermore Sewer	4½	1,000 00	19	19,000 00
Long Beach Pier	5	500 00	140	70,000 00
Los Angeles Water Works	4	1,000 00	480	480,000 00
Modesto Municipal Improvement	5	500 00	96	48,000 00
Morgan Hill Municipal Improvement	5	200 00	39	7,800 00
Mountain View Municipal Improvement	4½	700 00	29	20,300 00
Napa City Municipal Improvement	4	100 00	182	18,200 00

Fund—Continued.

Trust by the State Treasurer for the Benefit of the State School Fund, and the Sixty-eighth Fiscal Year.

Purchased		Redeemed		Balance on hand June 30, 1917		Amount of interest collected		
Number of bonds	Total value	Number of bonds	Total value	Number of bonds	Total value	Gross	Paid into school fund	Paid into school land fund
--------	------------	--------	------------	10	$5,000 00	$225 00	$225 00	------------
--------	------------	1	$1,250 00	7	8,750 00	500 00	500 00	------------
--------	------------	1	1,000 00	18	18,000 00	950 00	950 00	------------
--------	------------	1	1,500 00	26	39,000 00	2,025 00	2,025 00	------------
--------	------------	1	4,000 00	6	24,000 00	1,400 00	1,400 00	------------
18	$9,000 00	--------	------------	18	9,000 00	------------	------------	------------
--------	------------	1	1,000 00	1	1,000 00	100 00	100 00	------------
--------	------------	2	2,000 00	34	34,000 00	1,400 00	1,400 00	------------
40	20,000 00	--------	------------	40	20,000 00	500 00	------------	$500 00
--------	------------	5	5,000 00	175	175,000 00	7,200 00	7,200 00	------------
--------	------------	8	8,000 00	95	95,000 00	4,120 00	4,120 00	------------
--------	------------	3	3,000 00	79	79,000 00	3,690 00	3,690 00	------------
--------	------------	2	2,000 00	24	24,000 00	1,300 00	1,300 00	------------
--------	------------	1	1,000 00	7	7,000 00	400 00	400 00	------------
--------	------------	5	5,000 00	10	10,000 00	562 50	562 50	------------
--------	------------	2	1,500 00	72	54,000 00	2,737 50	2,737 50	------------
--------	------------	3	3,000 00	42	42,000 00	2,250 00	2,250 00	------------
--------	------------	1	1,500 00	35	52,500 00	2,700 00	2,700 00	------------
--------	------------	1	500 00	8	4,000 00	225 00	225 00	------------
--------	------------	1	500 00	13	6 500 00	350 00	350 00	------------
--------	------------	2	2,000 00	54	54,000 00	2,800 00	2,800 00	------------
--------	------------	--------	------------	10	3,000 00	150 00	150 00	------------
24	12,000 00	--------	------------	24	12,000 00	300 00	------------	300 00
--------	------------	--------	------------	30	30,000 00	1,500 00	1,500 00	------------
--------	------------	--------	------------	100	50,000 00	2,500 00	1,673 61	826 39
--------	------------	1	400 00	7	2,800 00	150 00	150 00	------------
--------	------------	1	1,000 00	9	9,000 00	475 00	475 00	------------
--------	------------	--------	------------	14	7,000 00	350 00	350 00	------------
--------	------------	1	1,000 00	36	36,000 00	1,825 00	1,825 00	------------
--------	------------	2	2,000 00	9	9,000 00	440 00	440 00	------------
--------	------------	1	500 00	11	11,000 00	562 00	------------	562 00
--------	------------	1	675 00	36	24,300 00	1,231 88	1,231 88	------------
--------	------------	1	500 00	28	14,000 00	725 00	725 00	------------
--------	------------	3	1,500 00	50	25,000 00	1,192 50	1,192 50	------------
--------	------------	2	1,000 00	56	28,000 00	1,425 00	1,425 00	------------
--------	------------	2	1,100 00	56	30,800 00	1,933 14	1,933 14	------------
--------	------------	2	2,000 00	51	51,000 00	2,600 00	2,600 00	------------
--------	------------	1	600 00	38	22,800 00	1,470 05	1,470 00	------------
--------	------------	--------	------------	12	6,000 00			
--------	------------	2	2,000 00	24	24,000 00	1,250 00	1,250 00	------------
--------	------------	--------	------------	67	67,000 00	3,750 32	3,750 32	------------
--------	------------	--------	------------	24	7,999 92			
--------	------------	1	500 00	31	15,500 00	787 50	787 50	------------
--------	------------	2	2,000 00	72	72,000 00	3,650 00	3,650 00	------------
--------	------------	--------	------------	91	45,000 00	2,275 00	2,275 00	------------
--------	------------	--------	------------	15	4,500 00	225 00	225 00	------------
--------	------------	3	1,500 00	51	25,500 00	1,312 50	1.312 50	------------
--------	------------	1	500 00	7	3,500 00	220 00	220 00	------------
--------	------------	1	1,000 00	36	36,000 00	2.737 50	2,737 50	------------
--------	------------	1	500 00	36	18,000 00			
--------	------------	7	1,750 00	245	61,250 00	3.465 00	3,465 00	------------
--------	------------	1	500 00	26	13,000 00	662 50	662 50	------------
--------	------------	1	1,000 00	18	18,000 00	832 50	832 50	------------
--------	------------	5	2,500 00	135	67,500 00	3,437 50	3,437 50	------------
--------	------------	15	15,000 00	465	465,000 00	18,900 00	18,900 00	------------
--------	------------	6	3,000 00	90	45,000 00	2,325 00	2,325 00	------------
--------	------------	1	200 00	38	7,600 00	385 00	385 00	------------
--------	------------	1	700 00	28	19,600 00	897 75	897 75	------------
--------	------------	14	1,400 00	168	16.800 00	728 00	728 00	------------

State School Land

Transactions in Bonds Purchased by the State School Land Fund, and Held in
Collections of Interest Thereon for

Title and classification of bonds	Rate of interest	Value of each bond	On hand July 1, 1916	
			Number of bonds	Total value
Ontario City Municipal Improvement	5	$1,000 00	13	$13,000 00
Ontario City Municipal Improvement	5	500 00	13	6,500 00
Ontario City Municipal Improvement	5	300 00	13	3,900 00
Orland City Municipal Improvement	5	1,000 00	46	46,000 00
Oroville Levee	5	1,000 00	13	13,000 00
Oroville Levee	5	500 00	66	33,000 00
Pasadena Municipal Improvement	4½	1,000 00	250	250,000 00
Pleasanton Municipal Improvement	4½	1,000 00	34	34,000 00
Pomona Park	4	750 00	27	20,250 00
Sacramento Sewer and Levee	4	1,000 00	110	110 000 00
Sacramento Levee	4	500 00	115	57,500 00
Sacramento Sewer	4	1,000 00	160	160,000 00
Sacramento Levee	4½	1,000 00	50	50,000 00
San Francisco Geary Street Railroad	4½	1,000 00	52	52,000 00
Santa Barbara Water Works	4½	1,000 00	70	70,000 00
San Buenaventura Municipal Improvement	5	400 00	7	2,800 00
San Buenaventura Municipal Improvement	5	100 00	7	700 00
San Buenaventura Municipal Improvement	5	100 00	17	1,700 00
Santa Clara Municipal Improvement	5½	1,000 00	45	45,000 00
Santa Clara Municipal Improvement	4½	525 00	31	16,275 00
Santa Clara Municipal Improvement	5	137 50	37	5,087 50
Santa Clara Municipal Improvement	4½	750 00	31	23,250 00
Sierra Madre Municipal Improvement	5	1,000 00	111	111,000 00
Sierra Madre Municipal Improvement	5	1,000 00	36	36,000 00
Sierra Madre Municipal Improvement	5	500 00	37	18,500 00
Visalia Municipal Improvement	5	625 00	32	20,000 00
Visalia Municipal Improvement	5	500 00	32	16,000 00
Wilmington Municipal Improvement	5	1,000 00	32	32,000 00
Wilmington Municipal Improvement	5	500 00	96	48,000 00
Yreka Municipal Improvement	5	500 00	58	29,000 00
Sausalito Municipal Improvement	5	1,000 00	54	54,000 00
Sausalito Municipal Improvement	5	500 00	27	13,500 00
San Buenaventura Municipal Improvement	5	1,000 00	24	24,000 00
San Buenaventura Municipal Improvement	5	600 00	6	3,600 00
Totals			7,103	$7,195,837 42

Fund—Continued.

Trust by the State Treasurer for the Benefit of the State School Fund, and the Sixty-eighth Fiscal Year.

Purchased		Redeemed		Balance on hand June 30, 1917		Amount of interest collected		
Number of bonds	Total value	Number of bonds	Total value	Number of bonds	Total value	Gross	Paid into school fund	Paid into school land fund
--------	------------	1	$1,000 00	12	$12,000 00	$1,125 00	$1,125 00	------------
--------	------------	1	500 00	12	6,000 00			
--------	------------	1	300 00	12	3,600 00			
--------	------------	2	2,000 00	44	44,000 00	2,300 00	2,300 00	------------
--------	------------	1	1,000 00	12	12,000 00	2,250 00	2,250 00	------------
--------	------------	2	1,000 00	64	32,000 00			
--------	------------	--------	------------	250	250,000 00	11,250 00	11,250 00	------------
--------	------------	1	1,000 00	33	33,000 00	1,530 00	1,530 00	------------
--------	------------	1	750 00	26	19,500 00	810 00	810 00	------------
--------	------------	5	5,000 00	105	105,000 00	4,400 00	4,400 00	------------
--------	------------	5	2,500 00	110	55,000 00	2,250 00	2,250 00	------------
--------	------------	5	5,000 00	155	155,000 00	6,400 00	6,400 00	------------
--------	------------	--------	------------	50	50,000 00	2,250 00	2,250 00	------------
--------	------------	--------	------------	52	52,000 00	2,340 00	2,340 00	------------
--------	------------	2	2,000 00	68	68,000 00	3,105 00	3,105 00	------------
--------	------------	1	400 00	6	2,400 00	260 00	260 00	------------
--------	------------	1	100 00	6	600 00			
--------	------------	1	100 00	16	1,600 00			
--------	------------	2	2,000 00	43	43,000 00	2,475 00	14 38	$2,460 62
--------	------------	1	525 00	30	15,750 00	732 27	732 27	------------
--------	------------	1	137 50	36	4,950 00	250 95	250 95	------------
--------	------------	1	750 00	30	22,500 00	1,046 25	1,046 25	------------
--------	------------	3	3,000 00	108	108,000 00	5,550 00	5,550 00	------------
--------	------------	1	1,000 00	35	35,000 00	1,800 00	1,800 00	------------
--------	------------	1	500 00	36	18,000 00	925 00	925 00	------------
--------	------------	1	625 00	31	19,375 00	1,000 00	1,000 00	------------
--------	------------	1	500 00	31	15,500 00	800 00	800 00	------------
--------	------------	1	1,000 00	31	31,000 00	4,000 00	4,000 00	------------
--------	------------	3	1,500 00	93	46,500 00			
--------	------------	3	1,500 00	55	27,500 00	1,412 50	1,412 50	------------
--------	------------	1	1,000 00	53	53,000 00	2,650 00	2,650 00	------------
--------	------------	3	1,500 00	24	12,000 00	362 50	362 50	------------
--------	------------	--------	------------	24	24,000 00	1,380 00	1,380 00	------------
--------	------------	--------	------------	6	3,600 00			
514	$428,200 00	280	$235,512 50	7,335	$7,388,524 92	$342,870 56	$337,483 55	$5,387 01

Surplus Money

Transactions in Bonds Puchased From Surplus Money of the General Fund, and Held Fiscal

Title and classification of bonds	Rate of interest	Par value of each bond	On hand July 1, 1916	
			Number of bonds	Total value
State of California Highways	4	$1,000 00	1,501	$1,501,000 00
Los Angeles City High School	4½	1,000 00		
Los Angeles City High School	4½	1,000 00		
Los Angeles City School District	4½	1,000 00		
State of California Highway	4	1,000 00		
			1,501	$1,501,000 00

Dissolved Savings

Transactions in Bonds Held in Trust by the State Treasurer for the Benefit of Sixty-eighth

Title and classification of bonds	Rate of interest	Par value of each bond	On hand July 1, 1916	
			Number of bonds	Total value
Butte City School District	5	$1,000 00	5	$5,000 00
Kern County	4½	1,000 00	33	33,000 00
Livermore Sewer	4½	1,000 00	1	1,000 00
Manzana School District	6	200 00	5	1,000 00
Nuevo School District	6	580 00	5	2,900 00
Rodden School District	6	250 00	10	2,500 00
Tropico City School District	5	250 00		
West Covina School District	5½	500 00		
			59	$45,400 00

Invested in Bonds.

in Trust by the State Treasurer, and Interest Collected Thereon for the Sixty-eighth Year.

Purchased		Bonds sold		Balance on hand June 30, 1917		Interest and premium collected		
Number of bonds	Total value	Number of bonds	Total value	Number of bonds	Total value	Gross	General fund	Interest and premium bond investment fund
--------	------------	350	$350,000 00	1,151	$1,151,000 00	$63,540 00	$13,400 00	$50,140 00
30	$30,000 00	--------	------------	30	30,000 00	------------	------------	------------
84	84,000 00	--------	------------	84	84,000 00	------------	------------	------------
120	120,000 00	--------	------------	120	120,000 00	------------	------------	------------
625	625,000 00	--------	------------	625	625,000 00	------------	------------	------------
859	$859,000 00	350	$350,000 00	2,010	$2,010,000 00	$63,540 00	$13,400 00	$50,140 00

Banks Fund.

the Dissolved Savings Banks Fund, and Collections of Interest Thereon for the Fiscal Year.

Purchased		Redeemed		Balance on hand June 30, 1917		Interest collected		
Number of bonds	Total value	Number of bonds	Total value	Number of bonds	Total value	Gross	Expense	Paid into dissolved savings bank fund
--------	------------	1	$1,000 00	4	$4,000 00	$225 00	------------	$225 00
--------	------------	--------	------------	33	33,000 00	1,485 00	------------	1,485 00
--------	------------	--------	------------	1	1,000 00	45 00	------------	45 00
--------	------------	1	200 00	4	800 00	60 00	------------	60 00
--------	------------	1	580 00	4	2,320 00	174 00	------------	174 00
--------	------------	1	250 00	9	2,250 00	142 50	------------	142 50
7	$1,750 00	--------	------------	7	1,750 00	43 75	------------	43 75
4	2.000 00	--------	------------	4	2,000 00	55 00	------------	55 00
11	$3,750 00	4	$2,030 00	66	$17,120 00	$2,230 25	------------	$2.230 25

School Teachers'

Bonds Purchased by the State Board of Education, and Held by the State and Collection of Interest Thereon for

Title and classification of bonds	Rate of interest	Par value of each bond	On hand July 1, 1916	
			Number of bonds	Total value
Corona City Municipal Improvement	5½	$1,000 00	4	$4,000 00
Coronado City Municipal Improvement	5	1,000 00	28	28,000 00
Farmdale School District	5	1,000 00	10	10,000 00
Fontana Heights School District	5	1,000 00	18	18,000 00
Keen Camp School District	6	500 00	5	2,500 00
Los Angeles City School District	4½	1,000 00	--------	------------
Los Angeles City Polytechnic High School District	3¾	1,000 00	10	10,000 00
Modesto Irrigation District	6	500 00	50	25,000 00
Ontario Municipal Improvement	5	550 00	7	3,850 00
Richmond School District	4½	1,000 00	11	11,000 00
Roseville Municipal Improvement	5	1,000 00	4	4,000 00
Sacramento City Municipal Improvement	4½	100 00	40	4,000 00
San Diego Fire Department	4½	500 00	58	29,000 00
San Francisco Fire Department	5	1,000 00	44	44,000 00
Sawtelle School Site	5½	1,000 00	18	18 000 00
State of California Highway	4	1,000 00	75	75,000 00
State of California Highway	4	1,000 00	35	35,000 00
Sebastopol Municipal Improvement	4½	750 00	2	1,500 00
Suisun Municipal Improvement	5	500 00	10	5,000 00
			429	$327,850 00

Permanent Fund.

Treasurer, in Trust, for the Benefit of the School Teachers' Permanent Fund, the Sixty-eighth Fiscal Year.

Purchased		Redeemed		Balance on hand June 30, 1917		Interest collected		
Number of bonds	Total value	Number of bonds	Total value	Number of bonds	Total value	Gross	Expense	Paid into teachers' permanent fund
--------	------------	--------	------------	4	$4,000 00	$220 00	------------	$220 00
--------	------------	2	$2,000 00	26	26,000 00	1,400 00	------------	1,400 00
--------	------------	1	1,000 00	9	9,000 00	500 00	------------	500 00
--------	------------	--------	------------	18	18,000 00	900 00	------------	900 00
--------	------------	1	500 00	4	2,000 00	150 00	------------	150 00
132	$132,000 00	--------	------------	132	132,000 00	------------	------------	------------
--------	------------	--------	------------	10	10.000 00	375 00	------------	375 00
--------	------------	--------	------------	50	25,000 00	1,500 00	------------	1,500 00
--------	------------	1	550 00	6	3.300 00	192 50	------------	192 50
--------	------------	--------	------------	11	11.000 00	495 00	------------	495 00
--------	------------	1	1,000 00	3	3.000 00	175 00	------------	175 00
--------	------------	8	800 00	32	3,200 00	162 00	------------	162 00
--------	------------	--------	------------	58	29,000 00	1,305 00	------------	1,305 00
--------	------------	--------	------------	44	44,000 00	2.200 00	------------	2,200 00
--------	------------	1	1,000 00	17	17,000 00	990 00	------------	990 00
--------	------------	--------	------------	75	75,000 00	3,000 00	------------	3.000 00
--------	------------	--------	------------	35	35,000 00	1,400 00	------------	1,400 00
--------	------------	--------	------------	2	1,500 00	67 50	------------	67 50
--------	------------	--------	------------	10	5,000 00	250 00	------------	250 00
132	$132,000 00	15	$6,850 00	543	$453,000 00	$15,282 00	------------	$15,282 00

Banks Holding State Deposits.

List of Banks Holding Deposits on June 30, 1917.

Bank	Amount
Alameda National Bank	$10,000 00
Alameda Savings Bank	20,000 00
American National Bank, Pomona	26.200 00
American National Bank, San Bernardino	16,000 00
American National Bank, San Diego	15,000 00
American National Bank, San Francisco	45,000 00
Anaheim National Bank	8,000 00
Anglo and London Paris National Bank, San Francisco	1,200,000 00
Amador Valley Savings Bank, Pleasanton	12,500 00
Analy Savings Bank, Sebastopol	17,500 00
Anglo California Trust Company, San Francisco	500,000 00
Antioch Bank of Savings	10.000 00
Auburn Savings Bank	15,900 00
Bank of California N. A., San Francisco	200,000 00
Bank of Campbell	9,000 00
Bank of Ceres	12,500 00
Bank of Cloverdale	20.000 00
Bank of Commerce and Trust Company, San Diego	144,000 00
Bank of Corning	15,000 00
Bank of Davis	12,500 00
Bank of Fruitvale	9 900 00
Bank of Galt	12,500 00
Bank of Hopland	4,500 00
Bank of Italy, San Francisco	285,000 00
Bank of Italy, Hollister	54,000 00
Bank of Italy, Livermore	29,650 00
Bank of Italy, Merced	10,000 00
Bank of Lemoore	5,000 00
Bank of Lincoln	16,000 00
Bank of Loleta	8 500 00
Bank of Loomis	11,500 00
Bank of Los Banos	40,000 00
Bank of Los Gatos	12,500 00
Bank of Morgan Hill	10 000 00
Bank of Newman	30,000 00
Bank of Orland	25,000 00
Bank of Pacific Grove	15,000 00
Bank of Princeton	29.000 00
Bank of San Jose	80,000 00
Bank of San Rafael	25,000 00
Bank of Santa Maria	11,800 00
Bank of Tehachapi	4,000 00
Bank of Tomales	18,000 00
Bank of Western Placer	7,200 00
Bank of Williams	15,500 00
Bank of Willits	11,000 00
Bank of Willows	50,000 00
Berkeley Bank of Savings and Trust Company	122,500 00
Butte County National Bank	100,000 00
Butte County Savings Bank	62,000 00
California National Bank, Sacramento	122,000 00
California Savings Bank, Petaluma	12,500 00
California Savings Bank, Sacramento	50,000 00
California State Bank, San Bernardino	12,500 00
Calistoga National Bank	9,000 00
Capital National Bank, Sacramento	300,000 00
Carver National Bank	25,000 00
Central Bank of Vallejo	20.000 00
Central National Bank, Oakland	22.500 00
Central Savings Bank, Oakland	125,000 00
Citizens Bank, Arlington	12 500 00
Citizens Bank, Corona	11,400 00
Citizens Bank, Paso Robles	7.200 00
Citizens Bank, Winters	20,300 00

Banks Holding State Deposits—Continued.

List of Banks Holding Deposits on June 30, 1917—Continued.

Bank	Amount
Citizens National Bank, Alameda	$24,500 00
Citizens National Bank, Riverside	27,500 00
Citizens Savings Bank, Inglewood	12 000 00
Citizens Savings Bank, Pasadena	25,000 00
Citizens Savings Bank, San Diego	45,000 00
Citizens Savings Bank, Upland	5,000 00
City National Bank, Long Beach	50,000 00
Claremont National Bank	5,850 00
Colton National Bank	8,500 00
Commercial Bank of Turlock	22,500 00
Commercial Bank, Ukiah	10,000 00
Commercial and Savings Bank, Stockton	30,000 00
Commercial State Bank, Oakdale	9,000 00
Consolidated Bank, Elsinore	7,000 00
Covina National Bank	12 500 00
Cuyamaca State Bank, El Cajon	6,250 00
Decker-Jewett & Company Bank, Marysville	30,000 00
Escondido National Bank	11,700 00
Exchange National Bank, Long Beach	38,350 00
Fairoaks Bank	10,000 00
Farmers and Mechanics Savings Bank, Sacramento	147,000 00
Farmers and Merchants Bank, Hayward	12,500 00
Farmers and Merchants Bank, Santa Paula	19,500 00
Farmers and Merchants Bank, Stockton	30,000 00
Farmers and Merchants National Bank, Hanford	20,000 00
Farmers and Merchants National Bank, Merced	50,000 00
Farmers and Merchants National Bank, Santa Cruz	40,000 00
Farmers and Merchants State Bank, Mountain View	20,000 00
First Bank of Jamestown	6,000 00
First Bank of Savings, Fort Bragg	5,000 00
First National Bank, Alturas	37,500 00
First National Bank, Antioch	2,500 00
First National Bank, Auburn	4,000 00
First National Bank, Berkeley	150,000 00
First National Bank, Chico	20,000 00
First National Bank, Colusa	17,000 00
First National Bank, Corona	9,500 00
First National Bank, Cucamonga	5,400 00
First National Bank, Dixon	11 500 00
First National Bank, Emeryville	10,000 00
First National Bank, Escondido	17,000 00
First National Bank, Eureka	75,000 00
First National Bank, Exeter	12,500 00
First National Bank, Fort Bragg	9,000 00
First National Bank, Fullerton	10,000 00
First National Bank, Gilroy	15,300 00
First National Bank, Hayward	12,500 00
First National Bank, Hemet	11,500 00
First National Bank, Lemoore	10 000 00
First National Bank, Lindsay	12,000 00
First National Bank, Livermore	16 000 00
First National Bank, Lodi	50,000 00
First National Bank, Lompoc	19,500 00
First National Bank, Los Banos	12,500 00
First National Bank, Monrovia	10,000 00
First National Bank, Monterey	8,750 00
First National Bank, Mountain View	6 500 00
First National Bank, Newport Beach	6,400 00
First National Bank, Oakdale	8,000 00
First National Bank, Ocean Park	10,000 00
First National Bank, Orange	19,000 00
First National Bank, Oroville	25,000 00
First National Bank, Palo Alto	20,000 00
First National Bank, Pleasanton	5,400 00

Banks Holding State Deposits—Continued.

List of Banks Holding Deposits on June 30, 1917—Continued.

Bank	Amount
First National Bank, Reedley	$3,400 00
First National Bank, Rialto	10,500 00
First National Bank, Richmond	15,000 00
First National Bank, Riverside	64,500 00
First National Bank of San Mateo County, Redwood City	15,000 00
First National Bank, San Pedro	10,000 00
First National Bank, Santa Barbara	34,000 00
First National Bank, Santa Cruz	25,000 00
First National Bank, Santa Maria	12,500 00
First National Bank, Scotia	12,500 00
First National Bank, Sebastopol	16,000 00
First National Bank, Sonoma	5,000 00
First National Bank, Sonora	50,000 00
First National Bank, Tustin	14,000 00
First National Bank, Vacaville	25,000 00
First National Bank, Vallejo	25,500 00
First National Bank, Weed	10,000 00
First National Bank, Winters	33,000 00
First National Bank, Woodland	62,500 00
First National Bank, Yreka	10,000 00
First Savings Bank, Colusa	6,000 00
First Savings Bank, Emeryville	10,000 00
First Savings Bank of Shasta County, Redding	5,000 00
First State Bank, Manteca	4,500 00
Fort Bragg Commercial Bank	5,400 00
Fort Sutter National Bank	49,500 00
French-American Bank of Savings, San Francisco	184,700 00
Fullerton Savings Bank	6,250 00
Garden City Bank and Trust Company, San Jose	110,000 00
Granite Savings Bank, Monrovia	7,500 00
Gridley State Bank	14,000 00
Guaranty Trust and Savings Bank, Los Angeles	360,000 00
Harbor City Savings Bank, San Pedro	12,000 00
Healdsburg Savings Bank	4,500 00
Hibernian Savings Bank, Los Angeles	100,000 00
Home Savings Bank, Escondido	11,000 00
Home Savings Bank, Woodland	62,500 00
International Bank, Calexico	11,500 00
Italian-American Bank, San Francisco	100,000 00
Jamestown National Bank	6,000 00
Knights Landing Branch of Home Savings Bank, Woodland	12,500 00
Lindsay National Bank	20,000 00
Lindsay Savings Bank	12,500 00
Livermore Valley Savings Bank	19,500 00
Los Angeles Trust and Savings Bank	100,000 00
Marin County National Bank, San Rafael	12,500 00
Mayfield Bank	7,000 00
Mendocino Bank of Commerce	12,300 00
Merchants National Bank, Los Angeles	300,000 00
Merchants National Bank, San Francisco	301,000 00
Merchants National Bank, Santa Monica	25,000 00
Mierson Banking Company, A., Placerville	10 000 00
Mission Bank, San Francisco	50,000 00
Mission Savings Bank, San Francisco	50,000 00
Montague Banking Company	18,000 00
National Bank of D. O. Mills & Company, Sacramento	125,000 00
National Bank of Orange	15,000 00
National Bank of Pasadena	30,000 00
National Bank, Riverside	10,000 00
Nevada County Bank, Grass Valley	20,000 00
Northern California National Bank, Redding	10,000 00
Northern Solano Savings Bank, Dixon	10,750 00
Novato Bank	10,000 00
Peoples Savings Bank, Sacramento	250,000 00

Banks Holding State Deposits—Continued.

List of Banks Holding Deposits on June 30, 1917—Continued.

Bank	Amount
Peoples National Bank, National City	$6,000 00
Peoples Savings Bank, Santa Cruz	10,000 00
Peoples Trust and Savings Bank, Riverside	8,500 00
Petaluma National Bank	65,000 00
Petaluma Savings Bank	25,000 00
Petaluma Swiss-American Bank	75,500 00
Portuguese-American Bank, San Francisco	19,000 00
Puente Savings Bank	12,500 00
Redlands National Bank	53,600 00
Reedley National Bank	4,500 00
Rideout-Smith National Bank, Oroville	32,000 00
Roseville Banking Company	17,000 00
Sacramento Bank	140,000 00
Sacramento Valley Bank and Trust Company	30,000 00
San Dimas Savings Bank	5,000 00
San Leandro State Bank	18,800 00
Santa Barbara Savings and Loan Bank	30,000 00
Santa Rosa Bank	33,000 00
Santa Rosa National Bank	24,000 00
Saratoga State Bank	3,875 00
Savings Bank of Mendocino County, Ukiah	10,000 00
Savings Bank of Pomona	9,000 00
Savings Bank of St. Helena	12,500 00
Security Bank, Oakland	45,000 00
Security National Bank, Los Angeles	150,000 00
Security Savings Bank, Exeter	12,500 00
Security Savings Bank, Riverside	50,000 00
Security Trust and Savings Bank, Los Angeles	500,000 00
Sierra Valley Bank, Loyalton	12,500 00
Siskiyou County Bank, Yreka	25,000 00
Sonoma County National Bank	85,000 00
State Bank of San Pedro	9,000 00
Savings Bank, Santa Rosa	30,000 00
Tehama County Savings Bank	12,500 00
Tuolumne County Bank, Sonora	25,000 00
Union National Bank, San Luis Obispo	20,350 00
Union Savings Bank, Redlands	10,000 00
Union Trust Company, San Francisco	212,000 00
Vallejo Commercial Bank	15,000 00
Wells-Fargo Nevada National Bank, San Francisco	500,000 00
West Side Bank, Tracy	20,000 00
Willits Commercial Bank	5,400 00
Total	$10,979,675 00

State Treasurer's Contingent Fund for Printing.

Sixty-eighth Fiscal Year.

July 31, 1916—To Department of State Printing	$354 64
Aug. 31, 1916—To Department of State Printing	95 35
Sept. 30, 1916—To Department of State Printing	5 96
Nov. 30, 1916—To Department of State Printing	14 75
Dec. 31, 1916—To Department of State Printing	35 05
Jan. 31, 1917—To Department of State Printing	518 57
Feb. 28, 1917—To Department of State Printing	59 91
Mar. 31, 1917—To Department of State Printing	24 68
April 30, 1917—To Department of State Printing	22 91
May 31, 1917—To Department of State Printing	137 63
June 30, 1917—To Department of State Printing	165 65
	$1,435 10

State Treasurer's Contingent Fund.

Expenditures From the State Treasurer's Contingent Fund for the Sixty-eighth Fiscal Year.

July, 1916—	Post office box rent	$4 00
	Postage	100 00
	Allen's Press Clipping Bureau	3 00
	Laundry	2 90
	Laura S. Wilson, salary	48 33
	Sleeper Stamp Co.	1 00
	Underwood Typewriter Co.	1 50
	Telephone	9 05
	State Purchasing Department	6 60
Aug., 1916—	Postage	150 00
	Allen's Press Clipping Bureau	3 00
	Laundry	2 00
	Laura S. Wilson, salary	83 85
	Underwood Typewriter Co.	3 00
	Western Union Telegraph Co.	1 81
	Telephone	21 90
	State Purchasing Department	7 95
	Woods-Creighton Co.	5 20
Sept., 1916—	Postage	50 00
	Allen's Press Clipping Bureau	3 00
	Western Union Telegraph Co.	1 05
	State Purchasing Department	2 34
	Laundry	3 50
	Telephone	7 95
Oct., 1916—	Allen's Press Clipping Bureau	3 00
	Laundry	3 00
	Postage	50 00
	Post office box rent	4 00
	State Purchasing Department	3 74
	Telephone	14 30
	Clara Hammill, salary	23 00
Nov., 1916—	Allen's Press Clipping Bureau	3 00
	Laundry	3 00
	Telephone	10 35
	Postage	50 00
	State Purchasing Department	6 66
	Western Union Telegraph Co.	1 55
Dec., 1916—	Allen's Press Clipping Bureau	3 00
	Laundry	2 00
	Telephone	7 10
	State Purchasing Department	5 17
	Postage	75 00
	Western Union Telegraph Co.	58
Jan., 1917—	Allen's Press Clipping Bureau	3 00
	Laundry	3 00
	Telephone	7 95
	Postage	75 00
	Post office box rent	4 00
	Stockwell Lock and Inspection Co.	10 00
	Laura S. Wilson, salary	54 83
	State Purchasing Department	7 83
	Underwood Typewriter Co.	1 50
	Western Union Telegraph Co.	97
Feb., 1917—	Allen's Press Clipping Bureau	3 00
	Laundry	2 90
	Telephone	13 25
	Postage	50 00
	Laura S. Wilson, salary	100 00
	Underwood Typewriter Co.	3 00
	Wahl Stationery Co.	3 60
	Western Union Telegraph Co.	1 03
	State Purchasing Department	9 31
Mar., 1917—	Wahl Stationery Co.	20 50
	Telephone	9 45
	Allen's Press Clipping Bureau	3 00
	Laundry	3 30
	Postage	50 00
	Western Union Telegraph Co.	46
	State Purchasing Department	5 63

State Treasurer's Contingent Fund—Continued.

Expenditures From the State Treasurer's Contingent Fund for the Sixty-eighth Fiscal Year.

April, 1917—	Allen's Press Clipping Bureau	$3 00
	Laundry	2 40
	Telephone	10 25
	Postage	50 00
	Post office box rent	4 00
	State Purchasing Department	9 56
	Western Union Telegraph Co.	4 40
May, 1917—	Allen's Press Clipping Bureau	3 00
	Laundry	2 90
	Telephone	8 55
	Postage	75 00
	State Purchasing Department	8 90
	Western Union Telegraph Co.	4 14
June, 1917—	Allen's Press Clipping Bureau	3 00
	Laundry	2 00
	Telephone	12 40
	Postage	100 00
	State Purchasing Department	9 27
	Western Union Telegraph Co.	1 41
	Capital-Sacramento Transfer Van and Storage Co.	8 13
		$1,563 34

CASH RECEIPTS.

Cash receipts in detail showing the funds of the state alphabetically arranged and the source from which they received payments for the sixty-ninth fiscal year.

Adult Blind Fund.		
Trustees Home for the Adult Blind		$46,257 69
Agnews Hospital Contingent Fund.		
Managers, Agnews Hospital		68,574 89
Agricultural Society Contingent Fund.		
State Agricultural Society	$94,331 94	
California Stallion Registration Board	75 00	94,406 94
Apple Standard Prosecution Fund.		
Commissioner of Horticulture		9,977 17
Ballot Paper Revolving Fund.		
Secretary of State		2,980 73
Banking Fund.		
Superintendent of Banks		95,798 01
Bond Investment Fund.		
State Treasurer, interest on bonds		70,629 64
Building and Loan Inspection Fund.		
Building and Loan Commissioner		10,537 42
Bureau of Labor Statistics Contingent Fund.		
Labor Commissioner		14,205 00
California Polytechnic School Contingent Fund.		
Trustees, California Polytechnic School		13,101 24
California School for Deaf and Blind Contingent Fund.		
Directors, California School for Deaf and Blind		7,355 44
California Training School for Girls Contingent Fund.		
Trustees, California Training School for Girls		1,417 12
California Reformatory Contingent Fund.		
Warden, San Quentin Prison		185 05
California Stallion Registration Board Contingent Fund.		
California Stallion Registration Board		1,359 03
Chico Normal School Contingent Fund.		
Trustees, Chico Normal School		1,697 04
Compensation Insurance Fund.		
State Treasurer, interest on bonds	$95,503 00	
Industrial Accident Commission	1,826,167 01	1,921,670 01
Corporation Commission Fund.		
Corporation Commissioner		67,829 73
Court of Appeal, First District, Library Fund.		
Court of Appeal, First District		1,095 60
Court of Appeal, Second District, Library Fund.		
Court of Appeal, Second District		1,916 71
Court of Appeal, Third District, Library Fund.		
Court of Appeal, Third District		532 33
Dentistry Fund.		
Board of Dental Examiners		15,784 28
Department of Engineering Revolving Fund.		
State Engineer		43,274 08
Detective License Fee Fund		
Board of Prison Directors		778 25
Dissolved Savings Bank Fund.		
State Treasurer, interest on bonds		4,247 20
Estates Deceased Persons Fund.		
Public Administrator, County of San Francisco	$3,412 27	
State Treasurer, interest on bonds	33,043 41	
County Treasurers	30,339 92	66,795 60

Cash Receipts—Continued.

Cash receipts in detail showing the funds of the state alphabetically arranged and the source from which they received payments for the sixty-ninth fiscal year.

Fish and Game Commission.		
Fish and Game Commission	$414,614 82	
Department of Engineering	68 66	$414,683 48
Folsom Prison Fund.		
Warden, Folsom Prison		15,007 77
Fresno Normal School Contingent Fund.		
Trustees, Fresno Normal School		865 26
General Fund.		
State Treasurer, bonds, interest, fees	$1,302,990 82	
Interest on state deposits in banks	311,131 29	
County Treasurers	3,766,580 11	
Superintendent of Public Instruction	11 31	
Attorney General	1,101 60	
Secretary of State	879,250 55	
Insurance Commissioner	41,041 45	
Surveyor General	5,387 89	
Sixth District Agricultural Association	190 65	
Warden, San Quentin Prison	500 00	
Warden, Folsom Prison	161 53	
Superintendent of State Printing	497 34	
Labor Commissioner	2,742 37	
Court of Appeal, First District	1,095 62	
Court of Appeal, Second District	1,916 69	
Court of Appeal, Third District	532 32	
Clerk, Supreme Court	6,753 84	
Commission in Lunacy	5,763 90	
Corporation Franchise Taxes	16,379,492 04	
State Engineer	26,136 64	
Industrial Accident Commission	2,843 01	
Superintendent, Capitol Building and Grounds	1,933 57	
State Dairy Bureau	14,852 89	
Board of Education	11,225 48	
Mining Bureau	650 84	
Board of Health	13,530 25	
Board of Control	7,930 70	
Superintendent of Weights and Measures	1,273 84	
R. A. Waring	1,004 14	
Controller	102 03	
Managers, Mendocino Hospital	403 72	
Civil Service Commission	541 66	
Pure Food Commission	1,973 45	
Managers, Southern California Hospital	544 77	
J. Paul Miller	52 16	
State Water Commission	17,883 12	
Trustees, California Training School for Girls	552 82	
Horticultural Commissioner	1,770 81	
W. C. Wood	6 13	
Industrial Welfare Commission	585 91	
Wm. A. Sullivan	35 61	
Immigration and Housing Commission	767 56	
Managers, Napa Hospital	17,092 69	
Trustees, Los Angeles Normal School	614 18	
Trustees, San Diego Normal School	231 00	
Board of Charities and Corrections	589 33	
State Purchasing Department	17,099 28	
Trustees, Humboldt Normal School	22 00	
Tax Commission	26 85	
Trustees, Whittier School	1,033 20	
Trustees, San Francisco Normal School	191 72	
Board of Forestry	635 00	
Trustees, Preston School	500 00	
Unknown, conscience refund	381 69	
Celeste Hill	1 20	
Jas. S. Kofod	80 63	
Jas. G. Quinn	80 63	
Managers, Sonoma Home	3 22	
Trustees, California School for Deaf and Blind	277 16	
Mrs. Harriett O. French	67 50	

Cash Receipts—Continued.

Cash receipts in detail showing the funds of the state alphabetically arranged and the source from which they received payments for the sixty-ninth fiscal year.

General Fund—Continued.		
J. C. Carly Co.	$59 75	
H. P. McBeth	10 87	
R. L. Hatch	77 40	
Trustees, San Jose Normal School	154 68	
Trustees, California Polytechnic School	174 23	
California Redwood Park Commission	874 85	
Western Union Telegraph Company	45 03	
Trustees, Chico Normal School	322 63	
State Veterinarian	4 09	
S. G. Miles	225 00	
J. F. Jewell & Co.	9 15	
C. E. Cooper	3 00	
Trustees, Sutter Fort	13 75	
Market Commission	4,299 90	
M. Madsen	5 00	
Legislative Counsel Bureau	4 00	
Managers, Stockton Hospital	27 60	
Board of Embalmers	72 00	
Mrs. M. S. McNaught	7 15	
Social Insurance Commission	19 55	
Criminal Identification Bureau	165 75	
Inheritance Tax Department	51	
Managers, Norwalk Hospital	38 76	
Trustees, Santa Barbara Normal School	133 33	
Reclamation Board	610 52	
Agricultural Society	75 00	$22,260,103 60
Highway Fund.		
State Engineer	$61,272 48	
Treasurer United States, contribution for road construction	33,173 03	94,445 51
Second Highway Fund.		
Mendocino County, contribution	$20,000 00	
Santa Barbara County, contribution	50,000 00	
Solano County, contribution	5,000 00	
State Engineer	91,708 40	
State Treasurer, sale of bonds	5,011,025 00	5,177,733 40
Second Highway Interest and Sinking Fund.		
State Treasurer, accrued interest on bonds sold		26,672 25
Humboldt Normal School Contingent Fund.		
Trustees, Humboldt Normal School		187 02
India Basin Fund.		
State Treasurer, sale of bonds		65,000 00
India Basin Sinking Fund.		
State Treasurer, accrued interest on bonds sold		1,213 33
Industrial Accident Fund.		
Industrial Accident Commission		4,582 18
Insurance Commissioners' Special Fund.		
Insurance Commissioner		60,039 34
Jute Revolving Fund.		
Warden, San Quentin Prison		309,741 39
Library Fund		
Trustees, State Library		1,693 71
Los Angeles Normal School Contingent Fund.		
Trustees, Los Angeles Normal School		1,654 93
Market Commission Fund.		
Market Commission		1,073 70
Medical Examiners' Contingent Fund.		
Board of Medical Examiners		46,656 39
Mendocino Hospital Contingent Fund.		
Managers, Mendocino Hospital		19,860 23

Cash Receipts—Continued.

Cash receipts in detail showing the funds of the state alphabetically arranged and the source from which they received payments for the sixty-ninth fiscal year.

Mining Bureau Fund.		
Mining Bureau		$1,369 99
Motor Vehicle Fund.		
Motor Vehicle Department, licenses	$3,535,399 84	
Department of Engineering	705,825 50	4,241,225 34
Napa Hospital Contingent Fund.		
Managers, Napa Hospital		93,741 37
Norwalk Hospital Contingent Fund.		
Managers, Norwalk Hospital		13,770 54
Nurses Examination and Registration Fund.		
Board of Health		3,329 63
Optometry Fund.		
Board of Optometry		3,329 63
Petroleum and Gas Fund.		
State Treasurer, taxes	$45,399 02	
Mining Bureau	228 70	45,627 72
Pharmacy Board Contingent Fund.		
Board of Pharmacy		5,236 57
Preston School Contingent Fund.		
Trustees, Preston School		2,979 66
Printing Fund.		
Superintendent State Printing		336,015 46
Railroad Commission Fund.		
Railroad Commission		58,671 21
Receiver's Fund		
James M. Warren, Receiver		225 00
Reclamation Board Revolving Fund.		
Reclamation Board		38,052 95
Real Estate Commissioner's Fund.		
Real Estate Commissioner	$42,979 94	
Board of Control	289 94	43,269 88
Sacramento and San Joaquin Drainage District Fund No. 1.		
County Treasurers	$79,747 92	
Reclamation Board	16 01	79,763 93
Sacramento and San Joaquin Drainage District Fund No. 3.		
County Treasurers		1,031,896 52
Sacramento and San Joaquin Drainage District Fund No. 5.		
County Treasurers	$7,876 72	
Reclamation Board	379 35	8,256 07
San Diego Harbor Improvement Fund.		
H. W. Johnston, trustee	$275 00	
San Diego Harbor Commission	294 16	569 16
San Diego Normal School Contingent Fund.		
Trustees, San Diego Normal School		2,201 04
San Francisco Harbor Improvement Fund.		
San Francisco Harbor Commission		2,316,295 13
San Francisco Normal School Contingent Fund.		
Trustees, San Francisco Normal School		2,701 17
Third San Francisco Seawall Fund.		
State Treasurer, sale of bonds		350,000 00
Third San Francisco Seawall Sinking Fund.		
State Treasurer, accrued interest on bonds sold		5,094 45
San Jose Normal School Contingent Fund.		
Trustees, San Jose Normal School		4 59
San Quentin Prison Fund.		
Warden, San Quentin Prison		323,745 61

Cash Receipts—Continued.

Cash receipts in detail showing the funds of the state alphabetically arranged and the source from which they received payments for the sixty-ninth fiscal year.

San Quentin Prison Manufacturing Revolving Fund.		
Warden, San Quentin Prison		$98,948 34
Santa Barbara Normal School Contingent Fund.		
Trustees, Santa Barbara Normal School		4,450 61
School Fund.		
State Treasurer, interest and redemption bonds	$354,582 90	
State Dairy Bureau	382 17	
University of California	6 00	
County Treasurers	67,809 82	
Public Administrator City and County of San Francisco	292 16	
Jas. B. Luddy, administrator	3,251 97	
Attorney General	18,145 38	444,470 40
School Book Fund.		
Superintendent of Public Instruction		5,477 74
School Land Fund.		
State Treasurer, interest and redemption bonds	$417,008 56	
Bank of Highgrove, unclaimed deposits	20 53	
Surveyor General	6,041 66	
County Treasurers	55,689 77	
First National Bank, Hemet	402 35	
Bank of Wm. Collins & Sons	323 56	
Bank of Monterey	22 32	
Bank of San Jose	376 63	
Assessor of Inyo County	2,361 00	
Farmers and Merchants National Bank, Los Angeles	3,612 57	
Chas. L. Reynolds	275 03	
Robert Wallace	2,258 52	
Security Savings Bank, San Francisco	9,010 16	497,402 66
School Land Deposit Fund.		
Surveyor General		260 00
School Teachers' Permanent Fund.		
State Treasurer, interest and redemption bonds	$37,453 50	
County Treasurers	191,551 25	
Board of Education	6,037 85	
Treasurer, city of San Luis Obispo	70 75	
Trustees, Humboldt Normal School	135 00	
Trustees, Los Angeles Normal School	845 00	
Trustees, San Diego Normal School	269 00	
Trustees, San Francisco Normal School	411 00	
Trustees, Chico Normal School	195 00	
Trustees, Fresno Normal School	329 00	
Trustees, Santa Barbara Normal School	184 00	
Trustees, San Jose Normal School	625 00	
Treasurer, city of San Jose	387 00	238,484 35
School Teachers' Retirement Salary Fund.		
Board of Education		520 04
Sixth District Agricultural Association Contingent Fund.		
Sixth District Agricultural Association		540 51
Sonoma Home Contingent Fund.		
Managers, Sonoma Home		26,219 25
Southern California Hospital Contingent Fund.		
Managers, Southern California Hospital		77,830 38
State University Fund.		
Fish and Game Commission		1,636 29
Stockton Hospital Contingent Fund.		
Managers, Stockton Hospital		53,792 57
Supreme Court Library Fund.		
Clerk, Supreme Court		1,688 46
Torrens Title Assurance Fund.		
County Recorders		5,596 21
United States Forest Reserve.		
United States Government		108,982 56

Cash Receipts—Continued.

Cash receipts in detail showing the funds of the state alphabetically arranged and the source from which they received payments for the sixty-ninth fiscal year.

University Fund.		
State Treasurer, interest on bonds		$49,845 00
Veterans' Home, Support and Maintenance Fund.		
United States Government	$80,650 00	
Directors, Veterans' Home	10,028 00	90,678 00
Veterinary Medicine Examiners' Contingent Fund.		
Board of Veterinary Medicine Examiners		320 00
Whittier School Contingent Fund.		
Trustees, Whittier School		31,976 23
Fish Exchange Fund.		
Market Commission		18,536 86
Land Settlement Fund.		
Land Settlement Board		11,785 00
Cattle Protection Fund.		
Cattle Protection Board		28,680 22
Purchasing Department Revolving Fund.		
State Purchasing Department		40,236 62
Kern County Union High School District Condemnation Fund.		
Clerk, Kern County		6,640 15
Industrial Terminal Railway et al. Condemnation Fund.		
Clerk, Los Angeles County		300,156 26
Accident Prevention Fund.		
Industrial Accident Commission		36,156 60
Meat Hygiene Fund.		
State Veterinarian		1,945 16
Napa State Farm Contingent Fund.		
Managers, Napa Hospital		13,627 99
Vocational Education Fund.		
United States Government		29,659 41
Operators' License Fund.		
Motor Vehicle Department, licenses		13,655 50
Total		$42,914,158 53

Summary of Receipts

Summary of Cash Receipts during the Sixty-ninth Fiscal Year, Summary of Transfer Receipts, Total Cash and Transfer

Funds	Cash receipts	Transfer receipts
Adult Blind Fund	$46,257 69	
Agnews Hospital Contingent Fund	68,574 89	
Agricultural Society Contingent Fund	94,406 94	
Apple Standard Prosecution Fund	9,977 17	
Ballot Paper Revolving Fund	2,980 73	
Banking Fund	95,798 01	
Bond Investment Fund	70,629 64	
Building and Loan Inspection Fund	10,537 42	
Bureau of Labor Statistics Contingent Fund	14,205 00	
California Polytechnic School Contingent Fund	13,101 24	
California School for Deaf and Blind Contingent Fund	7,355 44	
California Training School for Girls Contingent Fund	1,417 12	
California Reformatory Contingent Fund	185 05	
California Stallion Registration Board Contingent Fund	1,359 03	
Chico Normal School Contingent Fund	1,697 04	
Compensation Insurance Fund	1,921,670 01	
Corporation Commission Fund	67,829 73	
Court of Appeal, First District, Library Fund	1,095 60	
Court of Appeal, Second District, Library Fund	1,916 71	
Court of Appeal, Third District, Library Fund	532 33	
Dentistry Fund	15,784 28	
Department of Engineering Revolving Fund	43,274 08	
Detective License Fee Fund	778 25	
Dissolved Savings Bank Fund	4,247 20	
Estates of Deceased Persons Fund	66,795 60	
Fish and Game Preservation Fund	414,683 48	
Folsom Prison Fund	15,007 77	
Folsom Hospital Contingent Fund		
Foresty Fund		
Fresno Normal School Contingent Fund	865 26	
General Fund	22,860,103 60	$202,715 20
Gravelly Ford Canal Co. Condemnation Fund		
High School Fund		942,570 63
Highway Fund	94,445 51	8,801 42
Highway Interest and Sinking Fund		1,104,000 00
Second Highway Fund	5,177,733 40	
Second Highway Interest and Sinking Fund	26,672 25	198,575 25
Humboldt Normal School Contingent Fund	187 02	
India Basin Fund	65,000 00	
India Basin Sinking Fund	1,213 33	29,253 33
Industrial Accident Fund	4,582 18	
Insurance Commissioner's Special Fund	60,039 34	
Interest and Sinking Fund		141,435 00
Jute Revolving Fund	309,741 39	
Library Fund	1,693 71	125,000 00
Los Angeles Normal School Building and Improvement Fund		
Los Angeles Normal School Contingent Fund	1,654 93	
Market Commission Fund	1,073 70	49,720 00
Medical Examiners' Contingent Fund	46,656 39	
Mendocino Hospital Contingent Fund	19,860 23	
Mining Bureau Fund	1,369 99	
Motor Vehicle Fund	4,241,225 34	
Napa Hospital Contingent Fund	93,741 37	
Needles School District Bond Fund		
Norwalk Hospital Contingent Fund	13,770 54	
Nurses' Examination and Registration Fund	6,296 18	
Optometry Fund	3,329 63	
Panama-Pacific International Exposition Fund		
Petroleum Fund	45,627 72	
Pharmacy Board Contingent Fund	5,236 57	
Preston School of Industry Contingent Fund	2,979 66	
Printing Fund	336,015 46	
Railroad Commission Fund	58,671 21	
Railway Tax Fund		

and Payments.

Receipts and Payments, Balances Brought Forward July 1, 1917, Total Cash and Payments, and Balances Carried Forward June 30, 1918.

Total of cash and transfer receipts	Balances brought forward	Total of receipts and balances	Cash payments	Transfer payments	Total of cash and transfer payments	Balances carried forward
$46,257 69	$12,863 96	$59,121 65	$54.050 86	--------------	$54,050 86	$5,070 79
68,574 89	31,925 81	100,500 70	86,726 91	--------------	86,726 91	13,773 79
94.406 94	9.199 77	103,606 71	93,215 98	--------------	93,215 98	10,390 73
9,977 17	1,562 52	11,539 69	5,439 81	--------------	5,439 81	6,099 88
2,980 73	1.686 57	4.667 30	--------------	--------------	--------------	4,667 30
95,798 01	32,786 58	128,584 59	101,635 48	--------------	101,635 48	26,949 11
70.629 64	--------------	70 629 64	--------------	$70,629 64	70,629 64	--------------
10,537 42	14.273 70	24.811 12	11,726 36	--------------	11,726 36	13,084 76
14.205 00	12.132 69	26,337 69	10.370 84	--------------	10,370 84	15,966 85
13.101 24	1,394 24	14,495 48	9.968 63	--------------	9,968 63	4,526 85
7,355 44	2.212 30	9.567 74	5.482 10	--------------	5,482 10	4,085 64
1,417 12	163 25	1.580 37	1 000 00	--------------	1,000 00	580 37
185 05	3.594 11	3,779 16	2,446 71	1,332 45	3,779 16	--------------
1,359 03	3,920 36	5,279 39	3,273 12	--------------	3,273 12	2,006 27
1.697 04	2.644 20	4.341 24	870 88	--------------	870 88	3,470 36
1,921,670 01	212,182 27	2,133,852 28	1,789,295 41	--------------	1,789,295 41	344,556 87
67,829 73	9,031 40	76.861 13	55.906 24	--------------	55,906 24	20,954 89
1.095 60	6.334 77	7.430 37	1.000 74	5 80	1,006 54	6,423 83
1,916 71	7.614 99	9,531 70	1,382 90	--------------	1,382 90	8.148 80
532 33	1,707 11	2,239 44	394 30	--------------	394 30	1,845 14
15.784 28	9.168 94	24.953 22	13,831 69	--------------	13,831 69	11,121 53
43.274 08	8.228 11	51.502 19	46,405 89	--------------	46,405 89	5,096 30
778 25	1.275 89	2.054 14	--------------	--------------	--------------	2,054 14
4.247 20	12.062 05	16.309 25	--------------	--------------	--------------	16,309 25
66.795 60	54,510 94	121,306 54	56.607 66	--------------	56,607 66	64.698 88
414 683 48	66.402 66	481,086 14	320,848 19	--------------	320,848 19	160,237 95
15,007 77	15,132 70	30,140 47	13,944 47	2 51	13,946 98	16,193 49
--------------	179 00	179 00	--------------	--------------	--------------	179 00
--------------	169 88	169 88	--------------	--------------	--------------	169 88
865 26	2.536 72	3.401 98	1,429 30	--------------	1,429 30	1,972 68
23,062,818 80	7,502,945 68	30,565,764 48	14.474,269 20	10,193,999 99	24 668.269 19	5,897,495 29
--------------	5.800 00	5,800 00	--------------	--------------	--------------	5,800 00
942.570 63	12,596 53	955,167 16	955.132 24	--------------	955,132 24	34 92
103.246 93	4,907 88	108,154 81	86,032 41	--------------	86.032 41	22,122 40
1.104.000 00	400,000 00	1,504.000 00	1.104.000 00	--------------	1.104 000 00	400,000 00
5,177,733 40	--------------	5,177,733 40	4,617,758 64	8,801 42	4 626 560 06	551,173 34
225,247 50	--------------	225,247 50	225,112 50	--------------	225.112 50	135 00
187 02	254 97	441 99	351 91	--------------	351 91	90 08
65,000 00	13,568 20	78,568 20	--------------	--------------	--------------	78,568 20
30,466 66	--------------	30,466 66	25,000 00	4,166 66	29,166 66	1.300 00
4,582 18	5,749 30	10,331 48	7,174 67	--------------	7.174 67	3,156 81
60,039 34	4.657 91	64,697 25	33,354 69	--------------	33 354 69	31 342 56
141,435 00	70.717 50	212,152 50	141,435 00	--------------	141,435 00	70,717 50
309,741 39	177,745 55	487,486 94	288,649 26	--------------	288.649 26	198,837 68
126,693 71	9,053 23	135,746 94	113,717 90	--------------	113,717 90	22,029 04
--------------	3 32	3 32	--------------	--------------	--------------	3 32
1,654 93	1,416 87	3,071 80	2,046 95	--------------	2.046 95	1 024 85
50,793 70	4,475 64	55,269 34	16,888 71	--------------	16.888 71	38,380 63
46,656 39	7,683 99	54,340 38	34.021 06	--------------	34,021 06	20.319 32
19,860 23	18,102 76	37,962 99	13,722 99	--------------	13,722 99	24,240 00
1,369 99	2,386 25	3,756 24	2,554 10	--------------	2,554 10	1,202 14
4,241,225 34	2,023,033 06	6,264,258 40	3,155,619 87	106 00	3,155,725 87	3,108,532 53
93,741 37	24,056 38	117,797 75	92,189 24	--------------	92,189 24	25.608 51
--------------	183 75	183 75	--------------	--------------	--------------	183 75
13,770 54	3,360 49	17,131 03	6,506 19	--------------	6,506 19	10,624 84
6,296 18	34,251 92	40,548 10	29 678 94	--------------	29.678 94	10,869 16
3,329 63	1,243 91	4,573 54	4,238 39	--------------	4,238 39	335 15
--------------	15.465 71	15,465 71	313 00	--------------	313 00	15,152 71
45,627 72	70,706 84	116,334 56	94,316 24	--------------	94,316 24	22,018 32
5,236 57	9,988 80	15,225 37	--------------	--------------	--------------	15,225 37
2,979 66	11,708 85	14,688 51	8,502 06	--------------	8,502 06	6,186 45
336,015 46	4,287 53	340,302 99	310,865 41	--------------	310.865 41	29,437 58
58,671 21	28,869 39	87,540 60	39,543 50	--------------	39,543 50	47.997 10
--------------	30,251 36	30,251 36	--------------	--------------	--------------	30,251 36

Summary of Receipts

Summary of Cash Receipts during the Sixty-ninth Fiscal Year, Summary of Transfer Receipts, Total Cash and Transfer

Funds	Cash receipts	Transfer receipts
Receivers' Fund	$225 00	----------
Reclamation Board Revolving Fund	38,052 95	----------
Real Estate Commissioners' Fund	43,269 88	----------
Sacramento Drainage District Fund	----------	----------
Sacramento and San Joaquin Drainage District Fund No. 1	79,763 93	$16 00
Sacramento and San Joaquin Drainage District Fund No. 3	1,031,896 52	----------
Sacramento and San Joaquin Drainage District Fund No. 5	8,256 07	----------
San Diego Harbor Improvement Fund	569 16	----------
San Diego Normal School Contingent Fund	2,201 04	----------
San Francisco Harbor Improvement Fund	2,316,295 13	----------
San Francisco Normal School Contingent Fund	2,701 47	----------
San Francisco Normal Exposition Preservation Fund	----------	----------
San Francisco Seawall Sinking Fund	----------	144,204 98
Second San Francisco Seawall Fund	----------	23 22
Second San Francisco Seawall Sinking Fund	----------	420,000 00
Third San Francisco Seawall Fund	350,000 00	----------
Third San Francisco Seawall Sinking Fund	5,094 45	48,572 21
San Francisco State Building Fund	----------	----------
San Francisco State Building Sinking Fund	----------	58,400 00
San Jose Harbor Improvement Fund	----------	----------
San Jose Normal School Contingent Fund	4 59	----------
San Quentin Prison Fund	323,745 61	11,994 49
San Quentin Prison Manufacturing Revolving Fund	98,948 34	4,456 40
Santa Barbara Normal School Contingent Fund	4,450 61	----------
School Fund	444,470 40	5,474,560 00
School Book Fund	5,477 74	150,000 00
School Land Fund	497,402 66	34,096 07
School Land Deposit Fund	260 00	----------
School Teachers' Permanent Fund	238,484 35	191,547 59
School Teachers' Retirement Salary Fund	520 04	160,078 74
Sixth District Agricultural Association Contingent Fund	540 51	----------
Sonoma Home Contingent Fund	26,219 25	----------
Southern California Hospital Contingent Fund	77,830 38	----------
State University Fund	1,636 29	1,142,619 52
Stockton Hospital Contingent Fund	53,792 57	2 00
Superintendent Capitol Building and Grounds Contingent Fund	----------	----------
Supreme Court Library Fund	1,688 46	----------
Textbook Royalty Fund	----------	----------
Torrens Title Assurance Fund	5,596 21	----------
United States Forest Reserve Fund	108,982 56	----------
University Fund	49,845 00	----------
University of California Building Fund	----------	----------
University of California Building Sinking Fund	----------	81,000 00
Veterans' Home, Support and Maintenance Fund	90,678 00	150,000 00
Veterinary Medicine Examiners' Contingent Fund	320 00	----------
War Bond Fund	----------	----------
Whittier School Contingent Fund	31,976 23	----------
California Irrigation Board Revolving Fund	----------	7,840 00
Fish Exchange Fund	18,536 86	----------
Land Settlement Fund	11,785 00	250,000 00
Cattle Protection Fund	28,680 22	----------
Purchasing Department Revolving Fund	40,236 62	25,000 00
Kern County Union High School District Condemnation Fund	6,640 15	----------
Industrial Terminal Railway et al. Condemnation Fund	300,156 26	----------
Accident Prevention Fund	36,156 60	----------
Meat Hygiene Fund	1,945 16	----------
Napa Farm Contingent Fund	13,627 99	1,332 45
Vocational Education Fund	29,659 41	29,659 41
Operators' License Fund	13,655 50	106 00
Totals	$42,914,158 53	$11,187,580 51

and Payments—Continued.

Receipts and Payments, Balances Brought Forward July 1, 1917, Total Cash and Payments, and Balances Carried Forward June 30, 1918.

Total of cash and transfer receipts	Balances brought forward	Total of receipts and balances	Cash payments	Transfer payments	Total of cash and transfer payments	Balances carried forward
$225 00	$5,586 33	$5,811 33	$61 10		$61 10	$5,750 23
38,052 95	13,579 18	51,632 13	36,748 35	$16 00	36,764 35	14,867 78
43,269 88		43,269 88	14,908 09		14,908 09	28,361 79
	133 10	133 10				133 10
79,779 93	4,674 45	84,454 38	46,363 33		46,363 33	38,091 05
1,031,896 52		1,031,896 52	691,067 19		691,067 19	340,829 33
8.256 07	31,802 07	40,058 14	37,265 44		37,265 44	2,792 70
569 16	3,587 96	4,157 12				4.157 12
2,201 04	706 21	2,907 25	1,614 59		1,614 59	1,292 66
2,316,295 13	320,816 48	2,637,111 61	1,571,987 72	665,323 75	2,237,311 47	399,800 14
2,701 47	9,657 16	12,358 63	5,494 09		5,494 09	6,864 54
144,204 98	46.042 10	190,247 08	161,640 00		161,640 00	28,607 08
23 22	24,022 43	24,045 65	23,045 65		23,045 65	1,000 00
420,000 00		420,000 00	360,000 00	60,000 00	420,000 00	
350,000 00	907,263 71	1,257,263 71	1,221,159 93		1,221,159 93	36,103 78
53,666 66		53,666 66	44,000 00	6,666 66	50,666 66	3,000 00
	983,967 65	983,967 65	5,558 95		5,558 95	978,408 70
58,400 00		58.400 00	38,400 00		38,400 00	20,000 00
	2,495 27	2,495 27				2,495 27
4 59	543 49	548 08				548 08
335,740 10	33,813 89	369,553 99	220,967 17	4,456 40	225,423 57	144,130 42
103,404 74	47,275 54	150,680 28	92,268 90	11,994 49	104,263 39	46 416 89
4,450 61	6,521 72	10.972 33	6,106 36		6,106 36	4,865 97
5,919,030 40	300,178 81	6,219,209 21	5,955,013 71		5,955,013 71	264,195 50
155,477 74	256,273 76	411,751 50	112,522 88		112,522 88	299,228 62
531,498 73	75.819 34	607,318 07	309,092 52		309,092 52	298,225 55
260 00	7.540 00	7,800 00	140 00		140 00	7,660 00
430,031 94	130,284 82	560,316 76	330,255 06	160,078 74	490,333 80	69,982 96
160,598 78	72,877 88	233,476 66	232,307 64		232,307 64	1,169 02
540 51	2,311 05	2,851 56	1,553 70		1,553 70	1,297 86
26.219 25	13,861 51	40,080 76	20,581 02		20,581 02	19,499 74
77,830 38	8,422 42	86.252 80	55,437 81		55,437 81	30,814 99
1,144,255 81		1,144,255 81	1,142,619 52		1,142,619 52	1,636 29
53,795 17	9,747 70	63,542 87	45,212 39		45,212 39	18,330 48
	5,517 93	5,517 93				5,517 93
1,688 46	6,912 78	8,601 24	1,214 16		1,214 16	7,387 08
	340 43	340 43				340 43
5,596 21	3,329 18	8,925 39				8,925 39
108,982 56	2,060 81	111,043 37	111,043 37		111.043 37	
49,845 00		49.845 00	49.845 00		49.845 00	
	303,787 93	303,787 93	303,787 93		303,787 93	
81,000 00		81,000 00	81,000 00		81,000 00	
240,678 00	17,812 44	258,490 44	236,202 88		236,202 88	22,287 56
320 00	521 95	841 95	143 59		143 59	698 36
	2,829 76	2,829 76				2.829 76
31,976 23	23,558 66	55,534 89	9,241 77		9,241 77	46,293 12
7.840 00		7,840 00				7,840 00
18,536 86		18,536 86	9,916 46		9,916 46	8.620 40
261,785 00		261,785 00	196,203 02		196,203 02	65.581 98
28,680 22		28,680 22	12,346 53		12,346 53	16,333 69
65,236 62		65,236 62	57,755 20		57,755 20	7,481 42
6,640 15		6,640 15				6.640 15
300,156 26		300,156 26	300,156 26		300,156 26	
36,156 60		36,156 60	6,158 31		6.158 31	29,998 29
1,945 16		1,945 16	1,670 16		1,670 16	275 00
14,960 44		14,960 44	11,787 94		11,787 94	3.172 50
59,318 82		59,318 82	5,663 36		5,663 36	53,655 46
13,761 50		13,761 50	4 00		4 00	13,757 50
$54,101,739 04	$14,722,848 96	$68,824,588 00	$42,747,782 59	$11,187,580 51	$53,935,363 10	$14,889,224 90

Receipts from County Treasurers.

Receipts from County Treasurers for the Sixty-ninth Fiscal Year.

Counties	General fund	School fund	School land fund	Estates deceased persons fund
Alameda	$199,160 31	$100 00		$132 08
Alpine	7 11	756 00		
Amador	1,171 96	457 11		
Butte	30,004 07	545 23	$72 00	
Calaveras	2,057 35	83 25		
Colusa	21,444 38	33 60	161 25	
Contra Costa	15,402 28			
Del Norte	991 64	156 80	35 75	
El Dorado	11,989 21	280 00	2,160 00	
Fresno	21,095 65	6,297 63	7,405 85	
Glenn	45,141 78	403 20		
Humboldt	109,147 12	690 06	280 00	1,238 34
Imperial	19,339 41	2,055 01	1,280 00	633 13
Inyo	1,472 46	589 60	614 98	
Kern	50,006 24	5,034 29	7,176 25	
Kings	12,477 06	172 80	160 00	
Lake	944 58	242 60	320 00	
Lassen	693 22	9,488 18	2,160 00	
Los Angeles	851,572 42	1,549 87	40 00	
Madera	10,464 34	304 71	1,318 78	
Marin	24,198 30			
Mariposa	11,582 71	144 96	920 00	264 63
Mendocino	36,388 16	742 35	484 87	
Merced	14,959 25	190 46	520 00	
Modoc	3,225 39	1,608 15	1,600 00	
Mono	4,862 01	1,960 68	1,460 00	
Monterey	47,390 14	4,741 22	1,949 20	
Napa	66,534 60	217 28	40 00	
Nevada	2,180 80	22 40	320 00	
Orange	41,925 32	15 20		
Placer	23,470 24	53 17	160 00	
Plumas	760 57	33 60		
Riverside	6,503 06	3,337 14	3,280 00	
Sacramento	85,685 17			
San Benito	264 98	2,292 33	2,040 01	
San Bernardino	33,986 00	8,279 67	5,940 00	
San Diego	313,339 85	414 31	120 90	
San Francisco	1,011,239 02			22,295 38
San Joaquin	28,404 92	112 59	371 35	2,307 52
San Luis Obispo	55,829 03	3,582 99	1,772 15	
San Mateo	44,515 65	909 13	560 00	
Santa Barbara	63,345 33	109 13	119 68	
Santa Clara	25,445 19			
Santa Cruz	67,779 05	400 20	281 48	3,068 00
Shasta	22,120 96	338 52	316 85	87 74
Sierra	960 51			
Siskiyou	18,494 26	650 55	1,242 79	
Solano	88,202 71	776 80	240 00	
Sonoma	45,319 82	447 20	253 90	
Stanislaus	15,156 35	3,054 00	2,760 00	
Sutter	7,960 14			
Tehama	17,933 65	1,612 65	1,280 00	
Trinity	391 94	820 40	960 00	
Tulare	33,955 60	921 20	1,362 90	
Tuolumne	6,948 28	524 81	1,989 43	13 10
Ventura	37,609 20	185 59	160 00	
Yolo	8,373 41	71 20		
Yuba	34,756 25			
Totals	$3,766,580 41	$67,809 82	$55,689 77	$30,339 92

Receipts from County Treasurers—Continued.

Receipts from County Treasurers for the Sixty-ninth Fiscal Year.

Counties	School teachers' permanent fund	Sacramento and San Joaquin drainage district fund No. 1	Sacramento and San Joaquin drainage district fund No. 3	Sacramento and San Joaquin drainage district fund No. 5
Alameda	$16,994 00			
Alpine	25 00			
Amador	608 00			
Butte	1,756 50	$4,732 29		
Calaveras	577 00			
Colusa	663 00	4,958 19		
Contra Costa	3,021 00	1,636 60		
Del Norte	246 00			
El Dorado	470 55			
Fresno	6,420 00	13 91		
Glenn	535 00	1,762 62		
Humboldt	2,083 00			
Imperial	1,878 00			
Inyo	383 00			
Kern	3,049 90			
Kings	1,081 00			
Lake	478 05			
Lassen	391 00			
Los Angeles	58,082 00			
Madera	868 70			
Marin	2,086 00			
Mariposa	279 00			
Mendocino	1,744 50			
Merced	1,403 00	195 92		
Modoc	380 75			
Mono	127 00			
Monterey	1,625 50			
Napa	1,226 00			
Nevada	1,141 25			
Orange	3,239 00			
Placer	1,144 00			
Plumas	206 00			
Riverside	3,587 00			
Sacramento	5,442 00	12,701 99	$936,671 68	$4,043 08
San Benito	529 00			
San Bernardino	4,752 00			
San Diego	6,017 00			
San Francisco	23,572 00			
San Joaquin	3,568 00	18,659 22	21,410 64	3,833 64
San Luis Obispo	1,500 25			
San Mateo	2,263 00			
Santa Barbara	1,962 00			
Santa Clara	4,779 00			
Santa Cruz	1,759 00			
Shasta	1,130 00			
Sierra	176 00			
Siskiyou	1,183 00			
Solano	1,783 00	4,778 19	3,095 63	
Sonoma	3,210 00			
Stanislaus	1,625 00			
Sutter	514 00	16,698 88	14,988 21	
Tehama	976 00			
Trinity	215 00			
Tulare	3,210 00			
Tuolumne	561 00			
Ventura	1,724 30			
Yolo	1,007 00	10,309 02	55,730 36	
Yuba	264 00	3,289 70		
Totals	$191,551 25	$79,736 53	$1,031,896 52	$7,876 72

San Francisco Seawall Sinking Fund.

Transactions in the San Francisco Seawall Sinking Fund during the Sixty-ninth Fiscal Year.

RECEIPTS.

Date	Items	Investment returned to fund	Interest on investments	Principal	Transfer of interest	Total
7/ 1/17	To amounts brought forward	$1,160,298 75	$160,186 50	$1,100,519 54	$622,730 00	$3,043,734 79
7/ 2/17	To trans. from S. F. H. I. Fund			9,607 14	2.690 00	
8/ 1/17	To trans. from S. F. H. I. Fund			9,607 14	2.690 00	
9/ 1/17	To trans. from S. F. H. I. Fund			9.607 14	2,690 00	
10/ 1/17	To trans. from S. F. H. I. Fund			9,607 14	2,690 00	
11/ 1/17	To trans. from S. F. H. I. Fund			9,607 14	2,690 00	
12/ 1/17	To trans. from S. F. H. I. Fund			9,607 14	2.690 00	
1/ 2/18	To trans. from S. F. H. I. Fund			9.607 14	2.690 00	
2/ 1/18	To trans. from S. F. H. I. Fund			9,611 11	2,303 70	
3/ 1/18	To trans. from S. F. H. I. Fund			9,611 11	2,306 66	
4/ 1/18	To trans. from S. F. H. I. Fund			8.902 78	2,136 64	
5/ 1/18	To trans. from S. F. H. I. Fund			9.375 00	2 250 00	
6/ 1/18	To trans. from S. F. H. I. Fund			9,375 00	2,250 00	144,201 98
	Total transfer of principal			$1,214,644 52		
	Total of interest on investment applied to principal		$160,186 50	160.186 50		
	Total investment returned	$1,160,298 75		1,160,298 75		
	Totals			$2,535,129 77	$652,810 00	$3,187,939 77

DISBURSEMENTS.

Date	Items	Redemption of bonds	Transfer	Investment of principal	Interest paid	Total
7/ 1/17	By amounts brought forward	$1,193,000 00	$5,091 25	$1,174,202 69	$625,420 00	$2,997,713 94
12/11/17	By payment semiannual interest				16,140 00	
1/ 3/18	By redemption of bonds	115,000 00				
3/22/18	By redemption of bonds	17,000 00				
6/11/18	By payment semiannual interest				13,500 00	161,610 00
	Totals	$1,325,000 00	$5,091 25	$1,174,202 69	$655,060 00	$3,159,353 94
6/30/18	By redemption of San Francisco Seawall bonds			1,325,000 00		
	By transfers			5,091 25		
	By balance in fund			28,607 08		28,607 08
	Totals			$2,532,901 02	$655,060 00	$3,187,961 02

Second San Francisco Seawall Fund.

Transactions in the Second San Francisco Seawall Fund during the Sixty-ninth Fiscal Year.

RECEIPTS.

Date	Items	Amount	Total
7/ 1/17	To balance on hand		$24,022 43
8/ 7/17	To transfer from San Francisco Harbor Improvement Fund	$23 22	23 22
	Total		$24,045 65

DISBURSEMENTS.

Date	Items	Amount
7/ 2/17	By Robt. W. Hunt & Company	$47 33
7/ 2/17	By Healy-Tibbitts Construction Company	95 18
7/ 6/17	By Chas. R. McCormick & Company	13 75
7/ 9/17	By Blake Bros. Company	18,989 59
7/23/17	By J. Eugene Stevens	11 10
7/24/17	By New York Insulated Wire Company	464 34
7/24/17	By Geo. H. Tay Company	21 66
7/24/17	By Holabird Electrical Company	124 39
7/25/17	By Western Electric Company	72 98
8/ 1/17	By Robt. W. Hunt & Company	68 11
8/23/17	By Healy-Tibbitts Construction Company	381 69
8/23/17	By Chas. R. McCormick & Company	8 25
8/29/17	By Drendell Electric and Manufacturing Company	59 10
8/29/17	By New York Insulated Wire Company	164 76
9/27/17	By F. W. Richardson, State Treasurer	48 39
11/15/17	By G. W. McGinn & Company	2,464 15
1/12/18	By G. W. McGinn & Company	10 88
	Total	$23,045 65
	Total receipts	$24,045 65
	Total disbursements	23,045 65
	Balance in fund	$1,000 00

Second San Francisco Seawall Sinking Fund.

Transactions in the Second San Francisco Seawall Sinking Fund during the Sixty-ninth Fiscal Year.

RECEIPTS.

Date	Items	Interest	Transfer of interest	Total
7/ 1/17	To amounts brought forward	$112,279 56	$1,412,140 44	$1,524,420 00
7/ 2/17	To monthly transfer from S. F. H. I. Fund		30,000 00	
8/ 1/17	To monthly transfer from S. F. H. I. Fund		30,000 00	
9/ 1/17	To monthly transfer from S. F. H. I. Fund		30,000 00	
10/ 1/17	To monthly transfer from S. F. H. I. Fund		30,000 00	
11/ 1/17	To monthly transfer from S. F. H. I. Fund		30,000 00	
12/ 1/17	To monthly transfer from S. F. H. I. Fund		30,000 00	
12/ 8/17	To transfer from General Fund		30,000 00	
1/ 2/18	To monthly transfer from S. F. H. I. Fund		30,000 00	
2/ 1/18	To monthly transfer from S. F. H. I. Fund		30,000 00	
3/ 1/18	To monthly transfer from S. F. H. I. Fund		30,000 00	
4/ 1/18	To monthly transfer from S. F. H. I. Fund		30,000 00	
5/ 1/18	To monthly transfer from S. F. H. I. Fund		30,000 00	
6/ 1/18	To monthly transfer from S. F. H. I. Fund		30,000 00	
6/ 7/18	To transfer from General Fund		30,000 00	420,000 00
	Totals	$112,279 56	$1,832,140 44	$1,944,420 00

DISBURSEMENTS.

Date	Items	Interest paid	Total
7/ 1/17	By amounts brought forward		$1,524,420 00
7/ 2/17	By transfer to General Fund	$30,000 00	
12/11/17	By payment semiannual interest	180,000 00	
1/ 2/18	By transfer to General Fund	30,000 00	
6/11/18	By payment semiannual interest	180,000 00	420,000 00
	Total		$1,944,420 00

State Highway Fund.

Transactions in the State Highway Fund during the Sixty-ninth Fiscal Year.

RECEIPTS.

Date	Items	Amount
7/ 1/17	To balance on hand	$4,907 88
7/ 5/17	To Department of Engineering	12,829 21
7/13/17	To Department of Engineering	30,753 63
7/18/17	To Treasurer of the United States	33,173 03
8/ 2/17	To Department of Engineering	4,116 43
9/ 4/17	To Department of Engineering	1,573 21
10/ 1/17	To transfer from Second Highway Fund	8,801 42
4/24/18	To Department of Engineering	12,000 00
	Total	$108,154 81

DISBURSEMENTS.

Date	Items	Amount
7/ 5/17	By Department of Engineering	$16 40
7/ 9/17	By Department of Engineering	377 21
7/14/17	By Department of Engineering	3,746 05
8/ 1/17	By Department of Engineering	41,832 33
8/ 8/17	By Department of Engineering	6,164 50
10/ 3/17	By Department of Engineering	8,801 42
10/10/17	By Department of Engineering	25,000 00
1/ 5/18	By Department of Engineering	94 50
	Total	$86,032 41
	Balance in fund	22,122 40
		$108,154 81

State Highway Sinking Fund.

Transactions in the State Highway Sinking Fund during the Sixty-ninth Fiscal Year.

RECEIPTS.

Date	Items	Interest	Transfer of interest	Total
7/ 1/17	To amount brought forward			$2,764,200 00
12/ 8/17	To transfer from General Fund		$352,000 00	
6/ 7/18	To transfer from General Fund for interest		352,000 00	
	For redemption of bonds		400,000 00	1,104,000 00
	Totals		$1,104,000 00	$3,868,200 00

DISBURSEMENTS.

Date	Items	Interest paid	Total
7/ 1/17	By amount brought forward		$2,364,200 00
7/ 2/17	By redemption of bonds	$400,000 00	
12/20/17	By payment semiannual interest	352,000 00	
6/11/18	By payment semiannual interest	352,000 00	1,104,000 00
	Total		$3,468,200 00
	Balance in fund		400,000 00
			$3,868,200 00

Second State Highway Fund.

Transactions in the Second State Highway Fund during the Sixty-ninth Fiscal Year.

RECEIPTS.

Date	Items	Amount
8/ 1/17	To National City Company, purchase of 3,000 bonds	$3,000,000 00
9/ 1/17	To Department of Engineering	384 71
9/ 8/17	To National City Company, purchase of 1,750 bonds	1,750,000 00
9/ 8/17	To premium on above bonds	25 00
9/ 8/17	To State of California, purchase of 250 bonds	250,000 00
10/ 2/17	To Department of Engineering	13,206 08
10/10/17	To Department of Engineering	4 93
11/ 5/17	To Department of Engineering	3,131 42
12/ 3/17	To Department of Engineering	299 63
1/ 3/18	To Department of Engineering	233 38
2/ 4/18	To Department of Engineering	11,595 22
2/27/18	To Department of Engineering	26,398 73
3/ 2/18	To Department of Engineering	1,219 03
3/ 9/18	To Department of Engineering	25 00
3/12/18	To Mendocino County, donation	20,000 00
3/18/18	To Santa Barbara County, donation	50,000 00
3/26/18	To Department of Engineering	23 95
4/ 2/18	To Department of Engineering	1,747 37
5/ 2/18	To Department of Engineering	14,098 08
5/ 8/18	To National Bank of D. O. Mills & Co., purchase of 5 bonds	5,000 00
5/18/18	To Solano County, donation	5,000 00
6/ 5/18	To Department of Engineering	19,340 87
6/22/18	To National Bank D. O. Mills & Co., purchase of 6 bonds	6,000 00
	Total	$5,177,733 40

DISBURSEMENTS.

8/ 8/17	By Department of Engineering	$700,000 00
8/28/17	By Department of Engineering	7,811 30
9/ 5/17	By Department of Engineering	5,927 05
9/ 8/17	By Department of Engineering	8,237 13
9/11/17	By Department of Engineering	26,439 20
9/12/17	By Department of Engineering	9,572 59
9/17/17	By Department of Engineering	95,434 41
9/18/17	By Department of Engineering	14,748 58
9/20/17	By Department of Engineering	12,331 88
9/25/17	By Department of Engineering	47,170 22
9/27/17	By Department of Engineering	70 16
10/ 1/17	By Department of Engineering	3,183 24
10/ 1/17	By transfer to Highway Fund	8,801 42
10/ 3/17	By Department of Engineering	11,632 15
10/ 5/17	By Department of Engineering	38,589 42
10/ 9/17	By Department of Engineering	101,347 14
10/10/17	By Department of Engineering	11,958 98
10/16/17	By Department of Engineering	17,404 52
10/22/17	By Department of Engineering	9,663 83
10/23/17	By Department of Engineering	98,862 39
10/25/17	By Department of Engineering	50,087 72
10/29/17	By Department of Engineering	34,680 67
10/31/17	By Department of Engineering	74,888 51
11/ 1/17	By Department of Engineering	584 31
11/ 2/17	By Department of Engineering	22,719 55
11/ 5/17	By Department of Engineering	15,678 19
11/ 7/17	By Department of Engineering	7,936 96
11/ 8/17	By Department of Engineering	72,137 72
11/ 9/17	By Department of Engineering	4,633 67
11/14/17	By Department of Engineering	31,297 44
11/16/17	By Department of Engineering	7,928 04

Second State Highway Fund—Continued.

Transactions in the Second State Highway Fund during the Sixty-ninth Fiscal Year.

DISBURSEMENTS—Continued.

Date	Items	Amount
11/19/17	By Department of Engineering	$1,088 08
11/20/17	By Department of Engineering	12,227 45
11/23/17	By Department of Engineering	73,593 37
11/28/17	By Department of Engineering	9,952 19
11/30/17	By Department of Engineering	13,731 92
12/ 1/17	By Department of Engineering	48,050 21
12/ 7/17	By Department of Engineering	43,323 11
12/11/17	By Department of Engineering	2,434 57
12/12/17	By Department of Engineering	12,592 71
12/18/17	By Department of Engineering	13,925 50
12/26/17	By Department of Engineering	226,435 63
12/28/17	By Department of Engineering	43,746 03
1/ 2/18	By Department of Engineering	2,033 74
1/ 5/18	By Department of Engineering	37,981 94
1/ 7/18	By Department of Engineering	11,801 12
1/ 8/18	By Department of Engineering	10,410 01
1/ 9/18	By Department of Engineering	101,612 20
1/11/18	By Department of Engineering	1,014 65
1/14/18	By Department of Engineering	10,219 50
1/16/18	By Department of Engineering	35,144 19
1/17/18	By Department of Engineering	37 48
1/22/18	By Department of Engineering	23,477 17
1/26/18	By Department of Engineering	6,890 68
1/28/18	By Department of Engineering	115,630 70
2/ 1/18	By Department of Engineering	31,608 11
2/ 5/18	By Department of Engineering	4,517 87
2/ 6/18	By Department of Engineering	35,503 67
2/ 7/18	By Department of Engineering	67,477 01
2/ 8/18	By Department of Engineering	810 65
2/11/18	By Department of Engineering	50,116 56
2/18/18	By Department of Engineering	631 45
2/20/18	By Department of Engineering	19,122 87
2/25/18	By Department of Engineering	9,361 81
2/26/18	By Department of Engineering	98,331 05
2/28/18	By Department of Engineering	36,334 40
3/ 7/18	By Department of Engineering	33,140 80
3/ 8/18	By Department of Engineering	128 48
3/11/18	By Department of Engineering	72,541 80
3/12/18	By Department of Engineering	9,968 95
3/13/18	By Department of Engineering	110,019 48
3/19/18	By Department of Engineering	416 92
3/21/18	By Department of Engineering	80,067 77
3/22/18	By Department of Engineering	6,411 61
3/26/18	By Department of Engineering	9,590 41
3/28/18	By Department of Engineering	34,310 21
4/ 2/18	By Department of Engineering	43,936 34
4/ 4/18	By Department of Engineering	8,038 86
4/ 5/18	By Department of Engineering	135,543 78
4/ 9/18	By Department of Engineering	1,428 14
4/10/18	By Department of Engineering	6,775 37
4/11/18	By Department of Engineering	43,385 76
4/15/18	By Department of Engineering	23 75
4/17/18	By Department of Engineering	27,416 35
4/18/18	By Department of Engineering	78,095 28
4/19/18	By Department of Engineering	1,036 19
4/23/18	By Department of Engineering	37,164 05
4/24/18	By Department of Engineering	9,612 88
4/30/18	By Department of Engineering	9,615 39
5/ 1/18	By Department of Engineering	40,135 97
5/ 2/18	By Department of Engineering	778 53
5/ 3/18	By Department of Engineering	76,598 90
5/ 9/18	By Department of Engineering	109,433 94

Second State Highway Fund—Continued.

Transactions in the Second State Highway Fund during the Sixty-ninth Fiscal Year.

DISBURSEMENTS—Continued.

Date	Items	Amount
5/10/18	By Department of Engineering	$161 66
5/11/18	By Department of Engineering	1,691 27
5/15/18	By Department of Engineering	10,584 03
5/16/18	By Department of Engineering	1,092 40
5/17/18	By Department of Engineering	82,096 14
5/20/18	By Department of Engineering	11,242 80
5/22/18	By Department of Engineering	48,236 54
5/25/18	By Department of Engineering	11,441 45
5/27/18	By Department of Engineering	163 21
5/28/18	By Department of Engineering	24,283 38
5/31/18	By Department of Engineering	58,090 20
6/ 3/18	By Department of Engineering	55,634 29
6/ 4/18	By Department of Engineering	2,491 23
6/ 5/18	By Department of Engineering	48,091 65
6/ 6/18	By Department of Engineering	11,971 42
6/ 8/18	By Department of Engineering	38,905 64
6/11/18	By Department of Engineering	111,416 42
6/12/18	By Department of Engineering	120,873 71
6/13/18	By Department of Engineering	12,826 18
6/14/18	By Department of Engineering	11,227 77
6/17/18	By Department of Engineering	5,550 07
6/18/18	By Department of Engineering	59,036 80
6/22/18	By Department of Engineering	12,709 38
6/25/18	By Department of Engineering	44,255 61
6/27/18	By Department of Engineering	91,223 36
6/28/18	By Department of Engineering	2,683 51
	Total	$4,626,560 06
	Balance in fund	551,173 34
		$5,177,733 40

Second State Highway Sinking Fund.

Transactions in the Second State Highway Sinking Fund during the Sixty-ninth Fiscal Year.

RECEIPTS.

Date	Items	Interest	Transfer of interest	Total
8/ 1/17	To State Treasurer, accrued interest on sale of bonds	$10,500 00		
9/ 8/17	To State Treasurer, accrued interest on sale of bonds	14,000 00		
9/11/17	To State Treasurer, accrued interest on sale of bonds	1,968 75		
12/ 8/17	To transfer from General Fund		86,031 25	
3/ 8/18	To State Treasurer, accrued interest on sale of bonds	77 50		
6/ 7/18	To transfer from General Fund		112,535 00	
6/22/18	To State Treasurer, accrued interest on sale of bonds	126 00		
6/24/18	To transfer from General Fund		9 00	
	Totals	$26,672 25	$198,575 25	$225,247 50

DISBURSEMENTS.

Date	Items	Interest paid	Total
12/11/18	By payment semiannual interest	$112,500 00	
6/11/18	By payment semiannual interest	112,612 50	$225,112 50
	Total		$225,112 50
	Balance in fund		135 00
			$225,247 50

San Francisco State Building Fund.

Transactions in the San Francisco State Building Fund during the Sixty-ninth Fiscal Year.

RECEIPTS.

Date	Items	Amount
7/ 1/17	To balance on hand	$983,967 65

DISBURSEMENTS.

Date	Items	Amount
7/ 5/17	By Department of Engineering	$11 50
8/ 1/17	By Department of Engineering	68 43
8/ 1/17	By Department of Engineering	165 00
8/ 8/17	By Department of Engineering	73 45
8/29/17	By Department of Engineering	10 80
8/30/17	By Department of Engineering	26 67
9/11/17	By Department of Engineering	600 16
9/11/17	By Department of Engineering	5 90
9/11/17	By Department of Engineering	40 65
10/ 1/17	By Department of Engineering	7 65
10/ 1/17	By Department of Engineering	860 00
10/ 9/17	By Department of Engineering	85 60
10/23/17	By Department of Engineering	36 05
10/29/17	By Department of Engineering	1,314 94
10/31/17	By Department of Engineering	52 80
11/ 8/17	By Department of Engineering	22 89
11/ 8/17	By Department of Engineering	26 75
11/14/17	By Department of Engineering	6 90
11/28/17	By Department of Engineering	938 25
12/24/17	By Department of Engineering	245 60
1/ 9/18	By Department of Engineering	7 05
2/ 1/18	By Department of Engineering	42 06
2/11/18	By Department of Engineering	263 84
2/28/18	By Department of Engineering	6 50
3/ 7/18	By Department of Engineering	310 89
3/14/18	By Department of Engineering	9 20
3/21/18	By Department of Engineering	306 50
4/30/18	By Department of Engineering	12 92
	Total	$5,558 95
	Balance in fund	978,408 70
		$983,967 65

San Francisco State Building Sinking Fund.

Transactions in the San Francisco State Building Sinking Fund during the Sixty-ninth Fiscal Year.

RECEIPTS.

Date	Items	Interest	Transfer of interest	Total
7/ 1/17	To amounts brought forward	$4,258 89	$94,941 11	$99,200 00
12/ 8/17	To transfer from general fund, interest		19,200 00	
6/ 7/18	To transfer from general fund, redemption bond and interest		39,200 00	58,400 00
	Totals	$4,258 89	$153,341 11	$157,600 00

DISBURSEMENTS.

Date	Items	Interest paid	Total
7/ 1/17	By amounts brought forward		$99,200 00
12/11/17	By payment semiannual interest	19,200 00	
6/11/18	By payment semiannual interest	19,200 00	38,400 00
	Total		$137,600 00
	Balance in fund		20,000 00
			$157,600 00

Third San Francisco Seawall Fund.

Transactions in the Third San Francisco Seawall Fund during the Sixty-ninth Fiscal Year.

RECEIPTS.

Date	Items	Amount	Total
7/ 1/17	To balance on hand		$907,263 71
4/30/18	State of California, purchase of 200 bounds	$200,000 00	
6/ 5/18	To State of California, purchase of 150 bonds	150,000 00	350,000 00
	Total		$1,257,263 71

DISBURSEMENTS.

Date	Items	Total
7/10/17	By Healy-Tibbitts Construction Company	$41 95
7/12/17	By Healy-Tibbitts Construction Company	17,616 00
7/12/17	By Healy-Tibbitts Construction Company	11,377 50
7/12/17	By J. D. Hannah	9,300 00
7/12/17	By St. Helens Creosoting Company	4,077 38
7/17/17	By Clinton Construction Company	90 94
7/17/17	By Clinton Construction Company	1,120 50
7/17/17	By Clinton Construction Company	14,121 00
7/18/17	By F. W. Richardson, State Treasurer	3,643 16
7/20/17	By Hammond Lumber Company	1,094 66
7/20/17	By St. Helens Creosoting Company	3,919 99
7/24/17	By Pacific Portland Cement Company, Consolidated	5,092 20
7/24/17	By Healy-Tibbitts Construction Company	91 53
7/30/17	By St. Helens Creosoting Company	1,411 31
8/ 1/17	By Kinnear Manufacturing Company	2,251 00
8/ 1/17	By Kinnear Manufacturing Company	787 00
8/ 7/17	By Scott Company	174 91
8/ 7/17	By Scott Company	2,837 00
8/ 8/17	By St. Helens Creosoting Company	1,359 13
8/ 9/17	By St. Helens Creosoting Company	1,306 67
8/11/17	By J. D. Hannah	27,900 00
8/13/17	By Healy-Tibbitts Construction Company	11,377 50
8/20/17	By F. W. Richardson, State Treasurer	8,714 38
8/20/17	By Hammond Lumber Company	1,286 74
8/20/17	By Pacific Portland Cement Company, Consolidated	10,552 00
8/22/17	By J. M. Colman Company	1,746 11
8/24/17	By California Door Company	1 86
8/25/17	By Bashford Smith	13 20
8/29/17	By Pope & Talbot	46 75
8/29/17	By St. Helens Creosoting Company	470 44
8/29/17	By Charles R. McCormick & Co.	33 00
8/30/17	By Clinton Construction Company	3,720 51
8/30/17	By Clinton Construction Company	1,680 75
8/30/17	By Clinton Construction Company	4,491 50
8/30/17	By Judson Manufacturing Company	25 00
9/11/17	By Clinton Construction Company	46 24
9/13/17	By St. Helens Creosoting Company	6,681 73
9/15/17	By J. D. Hannah	31,620 00
9/17/17	By Healy-Tibbitts Construction Company	15,414 00
9/18/17	By Clinton Construction Company	12,000 00
9/18/17	By Clinton Construction Company	26,150 00
9/18/17	By F. W. Richardson, State Treasurer	2,241 00
9/18/17	By Healy-Tibbitts Construction Company	6,826 50
9/21/17	By Hammond Lumber Company	439 46
9/21/17	By Pacific Hardware and Steel Company	3 00
9/21/17	By Pope & Talbot	47 01
9/21/17	By J. M. Colman Company	582 04
9/21/17	By J. M. Colman Company	10,994 67
9/24/17	By McNab & Smith	27 00

Third San Francisco Seawall Fund—Continued.

ansactions in the Third San Francisco Seawall Fund during the Sixty-ninth Fiscal Year.

DISBURSEMENTS—Continued.

ate	Items	Total
5/17	By Clinton Construction Company	$272 20
9/17	By C. W. Marwedel	1 01
5/17	By Pacific Portland Cement Company, Consolidated	10,872 00
5/17	By John Finn Metal Works	5 18
5/17	By Baker & Hamilton	3 28
5/17	By Holabird Electric Company	16 45
7/17	By Bashford Smith	29 04
7/17	By Fay Improvement Company	61 29
7/17	By F. W. Richardson, State Treasurer	4,578 60
3/17	By J. Eugene Stevens	18 70
4/17	By Robert W. Hunt & Co.	253 94
5/17	By St. Helens Creosoting Company	5,142 29
6/17	By Healy-Tibbitts Construction Company	17,616 00
6/17	By J. D. Hannah	5,580 00
7/17	By Healy-Tibbitts Construction Company	7 74
7/17	By Healy-Tibbitts Construction Company	4,551 00
7/17	By St. Helens Creosoting Company	6,272 83
7/17	By St. Helens Creosoting Company	2,227 24
2/17	By F. W. Richardson, State Treasurer	4,063 61
2/17	By Bashford Smith	27 72
2/17	By Paynes Bolt Works	8 48
3/17	By Pacific Portland Cement Company, Consolidated	6,672 00
6/17	By Pope & Talbot	36 99
6/17	By McNab & Smith	12 00
6/17	By Hammond Lumber Company	865 62
9/17	By Robert W. Hunt & Company	74 41
1/17	By J. M. Colman Company	3,664 89
1/17	By St. Helens Creosoting Company	5,580 88
1/17	By St. Helens Creosoting Company	9,342 01
1/17	By Robert W. Hunt & Company	23 73
5/17	By E. Lauterbach	17 00
6/17	By Charles R. McCormick & Company	33 00
7/17	By Charles R. McCormick & Company	107 25
2/17	By St. Helens Creosoting Company	1,714 10
3/17	By Healy-Tibbitts Construction Company	33,030 00
3/17	By J. D. Hannah	41,850 00
4/17	By Clinton Construction Company	1,000 00
4/17	By J. M. Colman Company	2,108 73
5/17	By Robert W. Hunt & Company	169 13
5/17	By George W. McGinn & Company	505 85
9/17	By Marshall Newell Supply Company	3 87
9/17	By J. Eugene Stevens	5 60
0/17	By St. Helens Creosoting Company	2,090 95
0/17	By Pope & Talbot	45 96
0/17	By W. A. Plummer Manufacturing Company	55 00
1/17	By Central Coal Company	3 13
1/17	By Pacific Portland Cement Company	9,497 60
2/17	By F. W. Richardson, State Treasurer	4,219 02
8/17	By Clinton Construction Company	2,241 00
0/17	By Raisch Improvement Company	674 43
5/17	By Charles R. McCormick & Company	44 00
7/17	By St. Helens Creosoting Company	3,114 01
3/17	By St. Helens Creosoting Company	1,860 29
3/17	By St. Helens Creosoting Company	6,285 47
7/17	By Robert W. Hunt & Company	92 63
7/17	By G. W. McGinn & Company	249 70
7/17	By G. W. McGinn & Company	2,700 00
7/17	By G. W. McGinn & Company	646 46
7/17	By Healy-Tibbitts Construction Company	4,551 00
7/17	By Healy-Tibbitts Construction Company	24,222 00
8/17	By St. Helens Creosoting Company	9,196 74

Third San Francisco Seawall Fund—Continued.

Transactions in the Third San Francisco Seawall Fund during the Sixty-ninth Fiscal Year.

DISBURSEMENTS—Continued.

Date	Items	Total
12/18/17	By Marshall Newell Supply Company	$33 72
12/18/17	By Healy-Tibbitts Construction Company	7,362 45
12/19/17	By F. W. Richardson, State Treasurer	4,090 23
12/19/17	By Gladding, McBean & Company	5 00
12/21/17	By J. Eugene Stevens	5 90
12/21/17	By J. M. Colman Company	702 91
12/24/17	By Clinton Construction Company	671 38
12/24/17	By E. Lauterbach	27 55
12/26/17	By Clinton Construction Company	571 60
12/26/17	By Baker & Hamilton	68 60
12/26/17	By Pacific Portland Cement Company	7,475 20
12/26/17	By George H. Tay Company	1 53
1/ 4/18	By Healy-Tibbitts Construction Company	51 38
1/ 5/18	By Ames-Harris-Neville Company	1,164 24
1/ 9/18	By Clinton Construction Company	3,735 00
1/ 9/18	By Clinton Construction Company	95 80
1/ 9/18	By Clinton Construction Company	526 93
1/10/18	By Healy-Tibbitts Construction Company	3,640 80
1/10/18	By Healy-Tibbitts Construction Company	53,991 30
1/10/18	By Healy-Tibbitts Construction Company	30,828 00
1/10/18	By J. D. Hannah	19,530 00
1/14/18	By Robert W. Hunt & Company	131 48
1/16/18	By Clinton Construction Company	276 11
1/16/18	By St. Helens Creosoting Company	2,095 16
1/18/18	By Paynes Bolt Works	17 64
1/21/18	By J. Eugene Stevens	5 75
1/22/18	By F. W. Richardson, State Treasurer	3,925 47
1/22/18	By Baker & Hamilton	68 60
1/22/18	By Bashford Smith	51 92
1/24/18	By H. Crummey, Incorporated	5,082 00
1/28/18	By Pacific Portland Cement Company, Consolidated	10,037 44
2/ 5/18	By Healy-Tibbitts Construction Company	910 20
2/ 5/18	By Charles R. McCormick & Company	54 00
2/ 6/18	By Raisch Improvement Company	2,630 89
2/ 7/18	By Northwestern Redwood Company	417 53
2/ 7/18	By Northwestern Redwood Company	647 17
2/ 8/18	By Standard Blueprint Company	5 04
2/13/18	By Healy-Tibbitts Construction Company	760 85
2/14/18	By St. Helens Creosoting Company	18,449 03
2/14/18	By H. Crummey, Incorporated	2,326 28
2/14/18	By G. W. McGinn & Company	1,326 00
2/14/18	By E. Lauterbach	11 15
2/15/18	By Healy-Tibbitts Construction Company	13,212 00
2/15/18	By Healy-Tibbitts Construction Company	14,724 90
2/15/18	By J. D. Hannah	11,160 00
2/20/18	Navarro Lumber Company	5,347 78
2/23/18	By F. W. Richardson, State Treasurer	6,392 45
2/26/18	By E. Lauterbach	26 45
2/27/18	By Northwestern Redwood Company	457 94
2/27/18	By American Stevedore Company	135 07
2/27/18	By Henry C. Peterson, Incorporated	19 60
2/27/18	By H. N. Cook Belting Company	16 51
2/27/18	By Horsford Bros. Company	8 78
2/27/18	By Marshall Newell Supply Company	2 06
2/27/18	By Pacific Mill and Mine Supply Company	19 11
2/27/18	By St. Helens Creosoting Company	14,002 66
2/27/18	By Bashford Smith	63 00
2/27/18	By Pope & Talbot	177 24
2/27/18	By Meese & Gottfried Company	7 05
2/27/18	By Charles R. McCormick & Company	30 00
2/28/18	By Crowley Launch and Tugboat Company	30 00
2/28/18	By G. Lindauer	24 00

Third San Francisco Seawall Fund—Continued.

Transactions in the Third San Francisco Seawall Fund during the Sixty-ninth Fiscal Year.

DISBURSEMENTS—Continued.

Date	Items	Total
2/28/18	By Central Coal Company	$3 25
2/28/18	By California Saw Works	5 12
2/28/18	By Pacific Portland Cement Company, Consolidated	10,825 60
3/ 2/18	By Northwestern Redwood Company	457 07
3/ 4/18	By Navarro Lumber Company	2,665 99
3/ 5/18	By Northwestern Redwood Company	470 78
3/ 6/18	By Standard Blueprint Company	63 00
3/ 6/18	By C. Jorgensen & Company	8,496 56
3/ 8/18	By Navarro Lumber Company	1,373 50
3/ 9/18	By Healy-Tibbitts Construction Company	15,170 00
3/18/18	By J. D. Hannah	8,370 00
3/19/18	By Healy-Tibbitts Construction Company	4,908 30
3/20/18	By F. W. Richardson, State Treasurer	5,590 15
3/20/18	By J. Eugene Stevens	6 50
3/22/18	By Pacific Portland Cement Company, Consolidated	5,257 60
3/25/18	By H. Crummey Company	2,469 43
3/25/18	By H. N. Cook Belting Company	19 34
3/25/18	By Meese & Gottfried Company	14 26
3/25/18	By Robert W. Hunt & Company	227 43
3/28/18	By Central Coal Company	3 25
3/28/18	By C. Lindauer	44 00
3/28/18	By American Stevedore Company	24 34
3/28/18	By Bashford Smith	1 98
3/28/18	By T. Sholba	56 00
3/28/18	By J. D. Hannah	12,090 00
3/29/18	By Navarro Lumber Company	256 36
4/ 2/18	By Navarro Lumber Company	2,455 93
4/ 4/18	By Navarro Lumber Company	27 75
4/11/18	By California Construction Company	11,442 37
4/11/18	By Healy-Tibbitts Construction Company	26,995 65
4/11/18	By C. Jorgensen & Company	447 19
4/13/18	By Healy-Tibbitts Construction Company	8,808 00
4/13/18	By Navarro Lumber Company	176 28
4/17/18	By California Construction Company	15,801 38
4/20/18	By E. Lauterbach	23 50
4/22/18	By Standard Blueprint Company	24 54
4/22/18	By Meese & Gottfried Company	50
4/22/18	By American Stevedore Company	63 25
4/22/18	By Baker, Hamilton & Pacific Company	90
4/22/18	By H. N. Cook Belting Company	13 12
4/22/18	By Marshall Newell Supply Company	40
4/22/18	By Schwabacher-Frey Stationery Company	7 74
4/22/18	By Bashford Smith	9 93
4/23/18	By F. W. Richardson, State Treasurer	4,587 51
4/23/18	By Coffin-Redington Company	90
4/23/18	By Goodyear Rubber Company	28 26
4/24/18	By California Saw Works	3 06
4/25/18	By J. Eugene Stevens	5 10
4/30/18	By Central Coal Company	3 25
4/30/18	By G. Lindauer	47 00
5/ 1/18	By W. P. Fuller & Company	5 00
5/ 2/18	By Navarro Lumber Company	296 86
5/ 6/18	By T. Sholba	61 00
5/ 6/18	By J. D. Hannah	52,750 00
5/ 9/18	By Healy-Tibbitts Construction Company	31,903 95
5/ 9/18	By Healy-Tibbitts Construction Company	4,404 00
5/16/18	By C. Jorgensen & Company	2,981 25
5/17/18	By California Construction Company	21,795 00
5/17/18	By Pacific Portland Cement Company, Consolidated	3,534 38
5/18/18	By J. D. Hannah	4,750 00
5/18/18	By Navarro Lumber Company	356 84
5/18/18	By Charles R. McCormick & Company	54 00

Third San Francisco Seawall Fund—Continued.

Transactions in the Third San Francisco Seawall Fund during the Sixty-ninth Fiscal Year.

DISBURSEMENTS—Continued.

Date	Items	Total
5/18/18	By Charles R. McCormick & Company	$48 00
5/18/18	By St. Helens Creosoting Company	18,135 03
5/22/18	By Hartwood Lumber Company	275 30
5/22/18	By Pacific Portland Cement Company	8,329 60
5/22/18	By F. W. Richardson, State Treasurer	5,721 54
5/24/18	By Healy-Tibbitts Construction Company	854 67
5/27/18	By Standard Blueprint Company	8 10
5/28/18	By T. Sholba	1 00
6/ 4/18	By Healy-Tibbits Construction Company	2,128 00
6/ 5/18	By California Construction Company	5,448 75
6/ 6/18	By James Byrne, Jr.	23 10
6/ 8/18	By Healy-Tibbitts Construction Company	1,541 96
6/11/18	By Healy-Tibbitts Construction Company	466 46
6/13/18	By Robert W. Hunt & Company	134 94
6/13/18	By J. D. Hannah	14,722 24
6/14/18	By Healy-Tibbitts Construction Company	61,353 75
6/14/18	By Healy-Tibbitts Construction Company	4,404 00
6/17/18	By Healy-Tibbitts Construction Company	3,850 00
6/20/18	By F. W. Richardson	4,413 60
6/20/18	By Robert W. Hunt & Company	75 27
6/21/18	By McNabb & Smith	15 00
6/21/18	By St. Helens Creosoting Company	41,896 53
6/22/18	By California Door Company	5 39
6/22/18	By Standard Blueprint Company	120 21
6/25/18	By Central Coal Company	3 25
6/25/18	By Pacific Portland Cement Company	13,066 85
6/27/18	By Weinstock-Nichols Company	2 53
6/28/18	By J. D. Hannah	4,649 13
	Total	$1,221,159 93
	Balance in fund	36,103 78
		$1,257,263 71

Third San Francisco Seawall Sinking Fund.

Transactions in the Third San Francisco Seawall Sinking Fund during the Sixty-ninth Fiscal Year.

RECEIPTS.

Date	Items	Interest	Transfer of interest	Total
7/ 1/17	To amounts brought forward	$3,388 88	$16,611 12	$20,000 00
7/ 2/17	To transfer from S. F. Harbor Imp. Fund		3,333 33	
8/ 1/17	To transfer from S. F. Harbor Imp. Fund		3,333 35	
9/ 1/17	To transfer from S. F. Harbor Imp. Fund		3,333 33	
10/ 1/17	To transfer from S. F. Harbor Imp. Fund		3,333 33	
11/ 1/17	To transfer from S. F. Harbor Imp. Fund		3,333 33	
12/ 1/17	To transfer from S. F. Harbor Imp. Fund		3,333 33	
12/ 8/17	To transfer from General Fund		3,333 33	
1/ 2/18	To transfer from S. F. Harbor Imp. Fund		3,333 33	
2/ 2/18	To transfer from S. F. Harbor Imp. Fund		3,333 35	
3/ 1/18	To transfer from S. F. Harbor Imp. Fund		3,333 33	
4/ 1/18	To transfer from S. F. Harbor Imp. Fund		3,333 33	
4/30/18	To State Treasurer, accrued interest on bonds sold	2,577 78		
5/ 1/18	To transfer from S. F. Harbor Imp. Fund		3,422 21	
6/ 1/18	To transfer from S. F. Harbor Imp. Fund		4,000 00	
6/ 5/18	To State Treasurer, accrued interest on bonds sold	2,516 67		
6/ 7/18	To transfer from General Fund		4,483 33	53,666 66
	Totals	$8,483 33	$65,183 33	$73,666 66

DISBURSEMENTS.

Date	Items	Interest paid	Total
7/ 1/17	By amounts brought forward		$20,000 00
7/ 2/17	By transfer to General Fund	$3,333 33	
12/11/17	By payment semi-annual interest	20,000 00	
1/ 2/18	By transfer to General Fund	3,333 33	
6/11/18	By payment semi-annual interest	24,000 00	50,666 66
	Total		$70,666 66
	Balance in fund		3,000 00
			$73,666 66

University of California Building Fund.

Transactions in the University of California Building Fund during the Sixty-ninth Fiscal Year.

RECEIPTS.

Date	Items	Amount
7/ 1/17	To balance on hand	$303,787 93

DISBURSEMENTS.

Date	Items	Amount
8/20/17	By Regents University of California	$24,127 84
8/20/17	By Regents University of California	5,501 20
8/20/17	By Regents University of California	42,481 72
8/20/17	By Regents University of California	8,295 77
8/20/17	By Regents University of California	11,839 74
8/20/17	By Regents University of California	2,264 18
8/20/17	By Regents University of California	1,648 48
9/17/17	By Regents University of California	4,707 22
9/17/17	By Regents University of California	246 04
9/17/17	By Regents University of California	636 84
9/17/17	By Regents University of California	35,467 18
9/17/17	By Regents University of California	16,136 88
9/17/17	By Regents University of California	65,183 77
9/17/17	By Regents University of California	912 31
10/ 6/17	By Regents University of California	218 27
10/ 6/17	By Regents University of California	993 27
10/ 6/17	By Regents University of California	606 48
10/ 6/17	By Regents University of California	1,090 24
11/ 5/17	By Regents University of California	18,454 34
11/ 8/17	By Regents University of California	12,844 44
11/ 8/17	By Regents University of California	782 97
11/ 8/17	By Regents University of California	49,348 26
12/26/17	By Regents University of California	49
	Total	$303,787 93

University of California Building Sinking Fund.

Transactions in the University of California Building Sinking Fund during the Sixty-ninth Fiscal Year.

RECEIPTS.

Date	Items	Amount	Total
7/ 1/17	To amounts brought forward		$162,000 00
12/ 8/17	To transfer from General Fund	$40,500 00	
6/ 7/18	To transfer from General Fund	40,500 00	81,000 00
	Total		$243,000 00

DISBURSEMENTS.

Date	Items	Amount	Total
7/ 1/17	By amounts brought forward		$162,000 00
12/11/17	By payment semi-annual interest	$40,500 00	
6/11/18	By payment semi-annual interest	40,500 00	81,000 00
	Total		$243,000 00

India Basin Fund.

Transactions in the India Basin Fund during the Sixty-ninth Fiscal Year.

RECEIPTS.

Date	Items	Total amount
7/ 1/17	To amount on hand in fund	$13,568 20
6/21/18	To United Land Company, purchase of 65 bonds at $1,000 each	65,000 00
	Balance in fund	$78,568 20

India Basin Sinking Fund.

Transactions in the India Basin Sinking Fund during the Sixty-ninth Fiscal Year.

RECEIPTS.

Date	Items	Interest	Transfer of interest	Total
7/ 1/17	To amounts brought forward	$7,777 78	$4,722 22	$12,500 00
7/ 2/17	To transfer from S. F. H. I. Fund		2,083 33	
8/ 1/17	To monthly transfer from S. F. H. I. Fund		2,083 35	
9/ 1/17	To monthly transfer from S. F. H. I. Fund		2,083 33	
10/ 1/17	To monthly transfer from S. F. H. I. Fund		2,083 33	
11/ 1/17	To monthly transfer from S. F. H. I. Fund		2,083 33	
12/ 1/17	To monthly transfer from S. F. H. I. Fund		2,083 33	
12/ 8/17	To transfer from General Fund		2,083 33	
1/ 2/18	To monthly transfer from S. F. H. I. Fund		2,083 33	
2/ 1/18	To monthly transfer from S. F. H. I. Fund		2,083 35	
3/ 1/18	To monthly transfer from S. F. H. I. Fund		2,083 33	
4/ 1/18	To monthly transfer from S. F. H. I. Fund		2,083 33	
5/ 1/18	To monthly transfer from S. F. H. I. Fund		2,083 33	
6/ 1/18	To monthly transfer from S. F. H. I. Fund		2,083 33	
6/ 7/18	To transfer from General Fund		2,083 33	
6/21/18	To accrued interest on sale of bonds	1,213 33		
6/24/18	To transfer from General Fund		86 67	30,466 66
	Totals	$8,991 11	$33,975 55	$42,966 66

DISBURSEMENTS.

Date	Items	Interest paid	Total
7/ 1/17	By amounts brought forward		$12,500 00
7/ 2/17	By transfer to General Fund	$2,083 33	
12/11/17	By payment semi-annual interest	12,500 00	
1/ 2/18	By transfer from General Fund	2,083 33	
6/11/18	By payment semi-annual interest	12,500 00	29,166 66
	Total		$41,666 66
	Balance in fund		1,300 00
			$42,966 66

Interest on Deposits.

Statement of the Amount of Interest Collected from Banks Carrying State Deposits, During the Sixty-eighth and Sixty-ninth Fiscal Years.

Year and month	Amount	Year and month	Amount
1916—July	$19,662 80	1917—July	$23,313 39
August	19,704 26	August	24,348 01
September	19,128 58	September	24,033 00
October	19,645 00	October	25,715 81
November	19,194 02	November	25,695 92
December	19,327 03	December	26,122 87
1917—January	18,056 26	1918—January	26,967 86
February	18,849 99	February	25,944 26
March	17,154 37	March	28,854 02
April	21,420 54	April	28,500 36
May	22,149 15	May	29,390 94
June	22,245 36	June	29,424 02
	$236,537 36		$318,310 46

State School

Transactions in Bonds Held in Trust by the State Treasurer, for the Benefit of the for the Sixty-ninth

Title and classification of bonds	Rate of inter-est	Value of each bond	On hand July 1, 1917	
			Num-ber of bonds	Total value
United States Liberty Loan	4	$1,000 00	--------	------------
State of California, Highways	4	1,000 00	100	$100,000 00
State of California, funded debt of 1873	6	Various	150	1,526,500 00
Counties—				
Kern	4½	1,000 00	28	28,000 00
Lake	5	500 00	38	19,000 00
Mendocino	4	500 00	115	57,500 00
Monterey	4	1,000 00	28	28,000 00
Plumas	4	1,000 00	100	100,000 00
Riverside	4	1,000 00	130	130,000 00
San Benito	4½	1,000 00	15	15,000 00
Irrigation districts—				
South San Joaquin	5	500 00	100	50,000 00
Road districts—				
Indio permanent division	6	500 00	--------	------------
School districts—				
Anaheim Union High	5	1,000 00	49	49,000 00
Arden	5	500 00	18	9,000 00
Bakersfield	5	1,000 00	28	28,000 00
Belvedere	4½	1,000 00	8	8,000 00
Brawley	6	2,500 00	6	15,000 00
Brawley Union High	6	500 00	100	50,000 00
Capital	4½	1,000 00	31	31,000 00
Chino High	5	2,000 00	12	24,000 00
Cloverdale	5	1,000 00	29	29,000 00
Compton	5	1,000 00	12	12,000 00
Corona	5	1,000 00	30	30,000 00
Covina Union High	5	1,000 00	60	60,000 00
Del Paso Heights	5	500 00	23	11,500 00
Dixon	5	1,000 00	19	19,000 00
Duarte	5	1,000 00	11	11,000 00
El Monte Union High	5	1,000 00	15	15,000 00
Eureka	4½	1,000 00	7	7,000 00
Fairoaks	5	500 00	5	2,500 00
Fortuna High	5	800 00	30	24,000 00
Galt Joint Union High	6	1,000 00	45	45,000 00
Healdsburg	4	1,750 00	8	14,000 00
Hermosa Beach	5	1,000 00	19	19,000 00
Hudson	5	1,000 00	3	3,000 00
Huntington Park Union High	5	1,000 00	61	61,000 00
Huntington Park Union High	5	1,000 00	15	15,000 00
Jackson Joint Union High	5	500 00	44	22,000 00
Jefferson	5	2,250 00	17	38,250 00
Larkspur	5	500 00	10	5,000 00
Lincoln	6	300 00	9	2,700 00
Long Beach	5	1,000 00	110	110,000 00
Los Angeles City	4	1,000 00	22	22,000 00
Los Angeles City	4½	1,000 00	204	204,000 00
Los Angeles City	3¾	1,000 00	312	312,000 00
Madera	5	1,000 00	4	4,000 00
Madera	5	1,500 00	10	15,000 00
Madera	5	2,000 00	10	20,000 00
Madera	5	3,000 00	10	30,000 00
Modesto	5	1,000 00	32	32,000 00
New England Mills	5	200 00	20	4,000 00
Oakdale Union High	5	500 00	27	13,500 00
Oakland	4	1,000 00	224	224,000 00
Pacific	5	500 00	11	5,500 00
Palmdale	5	500 00	35	17,500 00
Pasadena City	4	1,000 00	42	42,000 00

Land Fund.

School Fund, and Owned by the School Land Fund, and Collection of Interest Thereon Fiscal Year.

Purchased		Redeemed		Balance on hand June 30, 1918		Interest collected		
Number of bonds	Total value	Number of bonds	Total value	Number of bonds	Total value	Gross	School fund	School land fund
231	$231,000 00	--------	--------	231	$231,000 00	$4,620 00	$4,620 00	--------
--------	--------	100	$100,000 00	--------	--------	4,000 00	4,000 00	--------
--------	--------	--------	--------	150	1,526,500 00	91,500 00	91,500 00	--------
--------	--------	28	28,000 00	--------	--------	630 00	630 00	--------
--------	--------	--------	--------	38	19,000 00	950 00	950 00	--------
--------	--------	5	2,500 00	110	55,000 00	2,250 00	2,250 00	--------
--------	--------	7	7,000 00	21	21,000 00	1,120 00	1,120 00	--------
--------	--------	40	40,000 00	60	60,000 00	3,200 00	3,200 00	--------
--------	--------	5	5,000 00	125	125,000 00	5,100 00	5,100 00	--------
--------	--------	3	3,000 00	12	12,000 00	675 00	675 00	--------
--------	--------	--------	--------	100	100,000 00	2,500 00	2,500 00	--------
130	65,000 00	--------	--------	130	65,000 00	3,900 00	3,900 00	--------
--------	--------	3	3,000 00	46	46,000 00	2,450 00	2,450 00	--------
--------	--------	2	1,000 00	16	8,000 00	450 00	450 00	--------
--------	--------	9	9,000 00	19	19,000 00	1,400 00	1,400 00	--------
--------	--------	1	1,000 00	7	7,000 00	360 00	360 00	--------
--------	--------	1	2,500 00	5	12,500 00	825 00	825 00	--------
--------	--------	--------	--------	100	50,000 00	2,500 00	2,500 00	--------
--------	--------	1	1,000 00	30	30,000 00	1,395 00	1,395 00	--------
--------	--------	1	2,000 00	11	22,000 00	1,200 00	1,200 00	--------
--------	--------	1	1,000 00	28	28,000 00	1,450 00	--------	$1,450 00
--------	--------	1	1,000 00	11	11,000 00	600 00	600 00	--------
--------	--------	--------	--------	30	30,000 00	1,500 00	1,500 00	--------
--------	--------	--------	--------	60	60,000 00	3,000 00	3,000 00	--------
--------	--------	1	500 00	22	22,000 00	575 00	575 00	--------
--------	--------	1	1,000 00	18	18,000 00	925 00	925 00	--------
--------	--------	1	1,000 00	10	10,000 00	550 00	550 00	--------
--------	--------	--------	--------	15	15,000 00	750 00	--------	750 00
--------	--------	1	1,000 00	6	6,000 00	315 00	315 00	--------
--------	--------	1	500 00	4	2,000 00	125 00	125 00	--------
--------	--------	6	4,800 00	24	19,200 00	1,080 00	1,073 33	6 67
--------	--------	2	2,000 00	43	43,000 00	2,640 00	2,640 00	--------
--------	--------	1	1,750 00	7	12,250 00	560 00	560 00	--------
--------	--------	1	1,000 00	18	18,000 00	950 00	950 00	--------
--------	--------	1	1,000 00	2	2,000 00	150 00	150 00	--------
--------	--------	2	2,000 00	59	59,000 00	3,050 00	3,050 00	--------
--------	--------	--------	--------	15	15,000 00	750 00	750 00	--------
--------	--------	2	1,000 00	42	21,000 00	1,100 00	1,100 00	--------
--------	--------	1	2,250 00	16	36,000 00	1,912 50	1,912 50	--------
--------	--------	1	500 00	9	4,500 00	250 00	108 33	141 67
--------	--------	1	300 00	8	2,400 00	162 00	--------	162 00
--------	--------	--------	--------	110	110,000 00	5,500 00	--------	5,500 00
--------	--------	--------	--------	22	22,000 00	880 00	880 00	--------
--------	--------	--------	--------	204	204,000 00	9,180 00	--------	9,180 00
--------	--------	12	12,000 00	300	300,000 00	11,700 00	11,700 00	--------
--------	--------	1	1,000 00	3	3,000 00	--------	--------	--------
--------	--------	--------	--------	10	15,000 00	3,425 00	3,425 00	--------
--------	--------	--------	--------	10	20,000 00			
--------	--------	--------	--------	10	30,000 00	--------	--------	--------
--------	--------	--------	--------	32	32,000 00	1,600 00	1,600 00	--------
--------	--------	1	200 00	19	3,800 00	195 00	89 67	105 33
--------	--------	3	1,500 00	24	12,000 00	675 00	675 00	--------
--------	--------	8	8,000 00	216	216,000 00	8,800 00	8,800 00	--------
--------	--------	1	500 00	10	5,000 00	275 00	275 00	--------
--------	--------	1	500 00	34	17,000 00	875 00	--------	875 00
--------	--------	2	2,000 00	40	40,000 00	1,680 00	1,680 00	--------

State School

Transactions in Bonds Held in Trust by the State Treasurer, for the Benefit of the for the Sixty-ninth

Title and classification of bonds	Rate of interest	Value of each bond	On hand July 1, 1917	
			Number of bonds	Total value
School districts—continued.				
Perris Union High	5	$1,000 00	19	$19,000 00
Pomona	4½	1,000 00	66	66,000 00
Pomona High	4	2,750 00	6	16,500 00
Pomona	4	750 00	26	19,500 00
Pomona	4½	500 00	10	5,000 00
Porterville High	5	1,250 00	7	8,750 00
Porterville	5	1,500 00	26	39,000 00
Porterville	5	1,000 00	18	18,000 00
Redlands-Lugonia-Crafton Union High	5	4,000 00	6	24,000 00
Roeding	5	1,000 00	1	1,000 00
Round Valley	6	500 00	18	9,000 00
Sacramento City	4	1,000 00	34	34,000 00
San Bernardino	4½	1,000 00	10	10,000 00
San Dimas	5	500 00	40	20,000 00
San Jose	4	1,000 00	175	175,000 00
San Jose High	4	1,000 00	95	95,000 00
San Mateo Union High	4½	1,000 00	79	79,000 00
San Rafael	5	1,000 00	24	24,000 00
San Rafael High	5	1,000 00	7	7,000 00
Santa Clara	5	750 00	72	54,000 00
Selma Union High	5	1,000 00	42	42,000 00
South Pasadena	5	1,500 00	35	52,500 00
Stone	5	500 00	8	4,000 00
Sutter	5	500 00	13	6,500 00
Turlock	5	1,000 00	54	54,000 00
Voltaire	5	200 00	--------	------------
Walnut Grove	5	300 00	10	3,000 00
Willow Spring	5	500 00	24	12,000 00
Winters Joint Union High	5	1,000 00	30	30,000 00
Cities and towns—				
Antioch Sewer	4	400 00	7	2,800 00
Antioch Water	4	1,000 00	9	9,000 00
Bakersfield Municipal Improvement	5	1,000 00	36	36,000 00
Bakersfield Municipal Improvement	5	500 00	14	7,000 00
Bakersfield Municipal Improvement	4	1,000 00	9	9,000 00
Bakersfield Fire	5	500 00	22	11,000 00
Bakersfield Library	5	675 00	36	24,300 00
Belvedere Street	4½	500 00	50	25,000 00
Belvedere Street	5	500 00	28	14,000 00
Bishop Municipal Improvement	6	550 00	56	30,800 00
Bishop Municipal Improvement	5	500 00	56	28,000 00
Colton Municipal Improvement	5	1,000 00	51	51,000 00
Corning Municipal Improvement	5	500 00	12	6,000 00
Corning Municipal Improvement	5	600 00	38	22,800 00
El Centro Municipal Improvement	5	1,000 00	24	24,000 00
Escondido Municipal Improvement	5	333 33	24	7,999 92
Escondido Municipal Improvement	5	1,000 00	67	67,000 00
Fairfield Municipal Improvement	5	500 00	31	15,500 00
Fullerton Road	5	500 00	91	45,500 00
Fullerton Road	5	300 00	15	4,500 00
Fullerton Municipal Improvement	5	1,000 00	72	72,000 00
Hermosa Beach	5	1,000 00	36	36,000 00
Hermosa Beach	5	500 00	36	18,000 00
Huntington Beach	5½	250 00	245	61,250 00
Inglewood Park	5½	500 00	7	3,500 00
Inglewood Municipal Improvement	5	500 00	51	25,500 00
Lemoore Municipal Improvement	5	500 00	26	13,000 00
Livermore Municipal Improvement	4½	1,000 00	18	18,000 00
Long Beach Pier	5	500 00	135	67,500 00
Los Angeles Water	4½	1,000 00	465	465,000 00

Land Fund—Continued.

School Fund, and Owned by the School Land Fund, and Collection of Interest Thereon Fiscal Year.

Purchased		Redeemed		Balance on hand June 30, 1918		Interest collected		
Number of bonds	Total value	Number of bonds	Total value	Number of bonds	Total value	Gross	School fund	School land fund
--------	--------	1	$1,000 00	18	$18,000 00	$950 00	$950 00	--------
--------	--------	2	2,000 00	64	64,000 00	2.970 00	2,970 00	--------
--------	--------	1	2,750 00	5	13,750 00	630 00	630 00	--------
--------	--------	1	750 00	25	18,750 00	780 00	780 00	--------
--------	--------	--------	--------	10	5,000 00	225 00	225 00	--------
--------	--------	1	1,250 00	6	7.500 00	437 50	437 50	--------
--------	--------	1	1,500 00	25	37,500 00	1,950 00	1,950 00	--------
--------	--------	1	1,000 00	17	17,000 00	900 00	900 00	--------
--------	--------	1	4,000 00	5	20,000 00	1,200 00	1,200 00	--------
--------	--------	1	1,000 00	--------	--------	50 00	50 00	--------
--------	--------	--------	--------	18	9,000 00	540 00	--------	$540 00
--------	--------	2	2,000 00	32	32 000 00	1,320 00	1,320 00	--------
--------	--------	5	5,000 00	5	5,000 00	337 50	337 50	--------
--------	--------	--------	--------	40	20,000 00	1,000 00	197 22	802 78
--------	--------	5	5,000 00	170	170,000 00	7,000 00	7,000 00	--------
--------	--------	8	8.000 00	87	87,000 00	3,800 00	3 800 00	--------
--------	--------	3	3.000 00	76	76.000 00	3,555 00	3,555 00	--------
--------	--------	2	2,000 00	22	22,000 00	1,200 00	1,200 00	--------
--------	--------	1	1,000 00	6	6 000 00	350 00	350 00	--------
--------	--------	2	1,500 00	70	52,500 00	2,632 50	2,662 50	--------
--------	--------	3	3.000 00	39	39.000 00	2.100 00	2,100 00	--------
--------	--------	1	1,500 00	34	51,000 00	2,700 00	2 700 00	--------
--------	--------	1	500 00	7	3,500 00	200 00	200 00	--------
--------	--------	1	500 00	12	6,000 00	325 00	325 00	--------
--------	--------	2	2,000 00	52	52.000 00	2,700 00	2,700 00	--------
8	$1,600 00	--------	--------	8	1,600 00	40 00	--------	40 00
--------	--------	--------	--------	10	3,000 00	150 00	150 00	--------
--------	--------	1	500 00	23	11,500 00	587 50	210 83	376 67
--------	--------	--------	--------	30	30,000 00	1,500 00	1,500 00	--------
--------	--------	1	400 00	6	2,400 00	130 00	130 00	--------
--------	--------	1	1,000 00	8	8.000 00	425 00	425 00	--------
--------	--------	1	1,000 00	35	35,000 00	2,125 00	2,125 00	--------
--------	--------	--------	--------	14	7,000 00			
--------	--------	2	2,000 00	7	7,000 00	360 00	360 00	--------
--------	--------	1	500 00	21	10,500 00	537 50	537 50	--------
--------	--------	1	675 00	35	23,625 00	1,198 13	1,198 13	--------
--------	--------	3	1,500 00	47	23,500 00	1,125 00	1.125 00	--------
--------	--------	1	500 00	27	13,500 00	700 00	700 00	--------
--------	--------	2	1,100 00	54	29,700 00	1,848 00	1.848 00	--------
--------	--------	2	1,000 00	54	27.000 00	1,375 00	1.375 00	--------
--------	--------	2	2.000 00	49	49,000 00	2,500 00	2,500 00	--------
--------	--------	--------	--------	12	6.000 00	1,440 00	1.440 00	--------
--------	--------	1	600 00	37	22,200 00			
--------	--------	2	2,000 00	22	22,000 00	1,150 00	1.150 00	--------
--------	--------	--------	--------	24	7,999 92	3,750 32	3,750 32	--------
--------	--------	--------	--------	67	67,000 00			
--------	--------	1	500 00	30	15,000 00	762 50	762 50	--------
--------	--------	--------	--------	91	45,500 00	2,500 00	2,500 00	--------
--------	--------	--------	--------	15	4,500 00			
--------	--------	2	2,000 00	70	70,000 00	3.550 00	3,550 00	--------
--------	--------	1	1,000 00	35	35,000 00	2.632 50	2,632 50	--------
--------	--------	1	500 00	35	17,500 00			
--------	--------	7	1,750 00	228	59,500 00	1.684 37	1.684 37	--------
--------	--------	1	500 00	6	3,000 00	192 50	192 50	--------
--------	--------	3	1,500 00	48	24,000 00	1.237 50	1,237 50	--------
--------	--------	1	500 00	25	12,500 00	637 50	637 50	--------
--------	--------	1	1,000 00	17	17,000 00	787 50	787 50	--------
--------	--------	5	2,500 00	130	65,000 00	3,312 50	3,312 50	--------
--------	--------	15	15,000 00	450	450,000 00	18,300 00	18,300 00	--------

State School

Transactions in Bonds Held in Trust by the State Treasurer, for the Benefit of the for the Sixty-ninth

Title and classification of bonds	Rate of interest	Value of each bond	On hand July 1, 1917	
			Number of bonds	Total value
Cities and towns—continued.				
Modesto Municipal Improvement	5	$500 00	90	$45,000 00
Morgan Hill Municipal Improvement	5	200 00	38	7.600 00
Mountain View Water	4½	700 00	28	19 600 00
Napa Municipal Improvement	4	100 00	168	16 800 00
Ontario Municipal Improvement	5	1,000 00	12	12,000 00
Ontario Municipal Improvement	5	500 00	12	6 000 00
Ontario Municipal Improvement	5	300 00	12	3 600 00
Oroville Levee	5	1,000 00	12	12 000 00
Oroville Levee	5	500 00	64	32,000 00
Orland Municipal Improvement	5	1,000 00	44	44.000 00
Pasadena Municipal Improvement	4½	1.000 00	250	250.000 00
Pleasanton Municipal Improvement	4½	1.000 00	33	33.000 00
Pomona Park	4	750 00	26	19,500 00
Sacramento Municipal Improvement	4	1.000 00	105	105,000 00
Sacramento Municipal Improvement	4	500 00	110	55.000 00
Sacramento Municipal Improvement	4	1,000 00	155	155,000 00
Sacramento Municipal Improvement	4½	1,000 00	50	50.000 00
San Buenaventura Town Hall	5	400 00	6	2,400 00
San Buenaventura Street Crosswalks	5	100 00	16	1,600 00
San Buenaventura Plaza Sidewalks	5	100 00	6	600 00
San Buenaventura Municipal Improvement	5	1,000 00	24	24,000 00
San Buenaventura Municipal Improvement	5	600 00	6	3,600 00
San Francisco Street Railway	4½	1,000 00	52	52,000 00
Santa Barbara Water	4½	1,000 00	68	68,000 00
Santa Clara Municipal Improvement	4½	750 00	30	22,500 00
Santa Clara Municipal Improvement	5	137 50	36	4,950 00
Santa Clara Water, Light and Power	4½	525 00	30	15,750 00
Santa Clara Municipal Highways	5½	1,000 00	26	26.000 00
Santa Clara Street	5½	1,000 00	17	17,000 00
Sausalito Municipal Improvement	5	1.000 00	52	52,000 00
Sausalito Municipal Improvement	5	500 00	26	13.000 00
Sierra Madre Municipal Improvement	5	500 00	36	18 000 00
Sierra Madre Municipal Improvement	5	1,000 00	35	35.000 00
Sierra Madre Municipal Improvement	5	1,000 00	108	108,000 00
Visalia Municipal Improvement	5	625 00	31	19.375 00
Visalia Municipal Improvement	5	500 00	31	15.500 00
Wilmington Municipal Improvement	5	1,000 00	31	31,000 00
Wilmington Municipal Improvement	5	500 00	93	46,500 00
Yreka Municipal Improvement	5	500 00	55	27,500 00
			7,247	$7,388,524 92

Land Fund—Continued.

School Fund, and Owned by the School Land Fund, and Collection of Interest Thereon Fiscal Year.

Purchased		Redeemed		Balance on hand June 30, 1918		Interest collected		
Number of bonds	Total value	Number of bonds	Total value	Number of bonds	Total value	Gross	School fund	School land fund
--------	------------	6	$3,000 00	84	$42,000 00	$2,175 00	$2,175 00	------------
--------	------------	1	200 00	37	7,400 00	375 00	375 00	------------
--------	------------	1	700 00	27	18,900 00	863 25	866 25	------------
--------	------------	14	1,400 00	154	15,400 00	672 00	672 00	------------
--------	------------	1	1,000 00	11	11,000 00	1,035 00	1,035 00	------------
--------	------------	1	500 00	11	5,500 00			
--------	------------	1	300 00	11	3,300 00			
--------	------------	1	1.000 00	11	11,000 00	2,150 00	2,150 00	------------
--------	------------	2	1.000 00	62	31,000 00			
--------	------------	2	2.000 00	42	42,000 00	2,200 00	2,200 00	------------
--------	------------	--------	------------	250	250,000 00	11,250 00	11,250 00	------------
--------	------------	1	1,000 00	32	32,000 00	1.485 00	1,485 00	------------
--------	------------	1	750 00	25	18,750 00	780 00	780 00	------------
--------	------------	5	5,000 00	100	100.000 00	4.200 00	4,200 00	------------
--------	------------	5	2,500 00	105	52,500 00	2.150 00	2,150 00	------------
--------	------------	5	5,000 00	150	150,000 00	6 200 00	6 200 00	------------
--------	------------	--------	------------	50	50,000 00	2,250 00	2,250 00	------------
--------	------------	1	400 00	5	2,000 00	230 00	230 00	------------
--------	------------	1	100 00	15	1,500 00			
--------	------------	1	100 00	5	500 00			
--------	------------	--------	------------	24	24.000 00	1,380 00	1,380 00	------------
--------	------------	--------	------------	6	3,600 00			
--------	------------	--------	------------	52	52,000 00	2,340 00	2,340 00	------------
--------	------------	2	2.000 00	63	66,000 00	3,015 00	3,015 00	------------
--------	------------	1	750 00	29	21,750 00	1,012 49	1,012 49	------------
--------	------------	1	137 50	35	4,812 50	244 06	244 06	------------
--------	------------	1	525 00	29	15,225 00	708 75	708 75	------------
--------	------------	1	1,000 00	25	25,000 00	2,365 00	2,365 00	------------
--------	------------	1	1,000 00	16	16,000 00			
--------	------------	2	2,000 00	50	50,000 00	3,187 50	3,187 50	------------
--------	------------	1	500 00	25	12,500 00			
--------	------------	1	500 00	35	17,500 00	900 00	900 00	------------
--------	------------	1	1,000 00	34	34.000 00	1,750 00	1.750 00	------------
--------	------------	3	3,000 00	105	105,000 00	5,400 00	5,400 00	------------
--------	------------	1	625 00	30	18.750 00	1,743 75	1,743 75	------------
--------	------------	1	500 00	30	15,000 00			
--------	------------	1	1,000 00	30	30,000 00	3,875 00	3,875 00	------------
--------	------------	3	1,500 00	90	45.000 00			
--------	------------	3	1,500 00	52	26,000 00	1,337 50	1,337 50	------------
304	$207,600 00	438	$387,062 50	7,230	$7,299,062 42	$361,962 62	$342,032 50	$19,930 10

School Teachers'

Transactions in Bonds Held in Trust by the State Treasurer, for the Benefit of for the Sixty-

Title and classification of bonds	Rate of interest	Total value of each bond	On hand July 1, 1917	
			Number of bonds	Total value
Corona, Municipal Improvement	5½	$1,000 00	4	$4,000 00
Coronado, Municipal Improvement	5	1,000 00	26	26,000 00
Farmdale School District	5	1,000 00	9	9,000 00
Fontana Heights School	5	1,000 00	18	18,000 00
Keen Camp School District	6	500 00	4	2,000 00
Los Angeles City School District	4½	1,000 00	132	132,000 00
Los Angeles Polytechnic High School	3¾	1,000 00	10	10,000 00
Modesto Irrigation District	6	500 00	50	25,000 00
Ontario, Municipal Improvement	5	550 00	6	3,300 00
Richmond School District	4½	1,000 00	11	11,000 00
Roseville, Municipal Improvement	5	1,000 00	3	3,000 00
Sacramento, Municipal Improvement	4½	100 00	32	3,200 00
San Diego Fire Department	4½	500 00	58	29,000 00
San Francisco Fire Department	5	1,000 00	44	44,000 00
Sawtelle, School Site	5½	1,000 00	17	17,000 00
State of California, Highways	4	1,000 00	110	110,000 00
State of California, Highways	4½	1,000 00	---------	------------
Sebastopol, Municipal Improvement	4½	750 00	2	1,500 00
Suisun, Municipal Improvement	5	500 00	10	5,000 00
United States Liberty Loan	4	1,000 00	---------	------------
			546	$453,000 00

Permanent Fund.

the School Teachers' Permanent Fund, and Amount of Interest Collected Thereon, ninth Fiscal Year.

Purchased		Redeemed		Balance on hand June 30, 1918		Amount of interest collected	
Number of bonds	Total value	Number of bonds	Total value	Number of bonds	Total value	Gross	Paid into Teachers' Permanent Fund
				4	$4,000 00	$220 00	$220 00
		2	$2,000 00	24	24,000 00	1,300 00	1,300 00
		1	1,000 00	8	8,000 00	450 00	450 00
				18	18,000 00	900 00	900 00
		1	500 00	3	1,500 00	120 00	120 00
				132	132,000 00	5,940 00	5,940 00
				10	10,000 00	375 00	375 00
				50	25,000 00	1,500 00	1,500 00
		1	550 00	5	2,750 00	165 00	165 00
		2	2,000 00	9	9,000 00	450 00	450 00
		1	1,000 00	2	2,000 00	125 00	125 00
		8	800 00	24	2,400 00	126 00	126 00
				58	29,000 00	1,305 00	1,305 00
				44	44,000 00	2,200 00	2,200 00
		1	1,000 00	16	16,000 00	935 00	935 00
				110	110,000 00	4,400 00	4,400 00
250	$250,000 00			250	250,000 00	5,625 00	5,625 00
		1	750 00	1	750 00	67 50	67 50
				10	5,000 00	250 00	250 00
70	70,000 00			70	70,000 00	1,400 00	1,400 00
320	$320,000 00	18	9,600 00	848	$763,400 00	$27,858 50	$27,858 50

State Compensation

Transactions in Bonds Purchased by the Industrial Accident Commission, and Insurance Fund, and Collection of Interest

Title and classification of bonds	Rate of interest	Total value of each bond	On hand July 1, 1917	
			Number of bonds	Total value
Benicia School District	5	$1,000 00	15	$15,000 00
Ceres High School District	5	1,000 00	35	35,000 00
Coalinga Union High School District	5	1,000 00	----------	------------
Compton, Municipal Improvement	5½	750 00	39	29,250 00
Compton, Municipal Improvement	5½	1,000 00	39	39,000 00
Corona, Municipal Improvement	5	912 50	35	31,937 50
Corte Madera, Street Improvement	5	500 00	----------	------------
Corte Madera, Street Improvement	5	1,000 00	----------	------------
Daly City, Water Works	5½	1,000 00	90	90,000 00
Eagle Rock, Water Works	5	1,000 00	70	70,000 00
El Monte, Water Works	6	250 00	35	8,750 00
El Monte, Water Works	6	500 00	35	17,500 00
Esperanza School District	6	250 00	14	3,500 00
Flowery School District	6	400 00	9	3,600 00
Freeport School District	5	500 00	15	7,500 00
Hanford, Municipal Improvement	5	1,000 00	72	72,000 00
Hermosa Beach, Municipal Improvement	5½	333 33	13	4,333 33
Hermosa Beach, Municipal Improvement	5½	666 66	13	8,666 66
Hughson School District	5	1,000 00	20	20,000 00
Independent School District	6	500 00	8	4,000 00
Kingsburg Joint Union High School District	6	1,000 00	40	40,000 00
La Canada School District	5	1,000 00	25	25,000 00
Larkspur School District	5	1,000 00	7	7,000 00
Lompoc, Municipal Improvement	5	1,000 00	55	55,000 00
Napa City, Municipal Improvement	5	1,000 00	25	25,000 00
Newport Beach, Municipal Improvement	5	1,000 00	----------	------------
Newport Beach, Municipal Improvement	5	500 00	----------	------------
Newport Beach, Municipal Improvement	5	106 25	----------	------------
Newport Beach, Municipal Improvement	5	100 00	----------	------------
North Sacramento School District	5	500 00	48	24,000 00
Newport Beach, Municipal Improvement	5	1,000 00	22	22,000 00
Oasis School District	6	250 00	7	1,750 00
Orange City, Bridge	5	500 00	18	9,000 00
Orland, Municipal Improvement	5	500 00	13	6,500 00
Palo Alto, Subway	5	237 50	38	9,025 00
Paradise Irrigation District	6	1,000 00	----------	------------
Placentia-Richfield School District	5	1,500 00	20	30,000 00
Randolph School District	5	1,000 00	63	63,000 00
Rio Vista Joint Union School District	5	1,000 00	54	54,000 00
Riverbank School District	6	500 00	16	8,000 00
San Anselmo School District	5	1,000 00	17	17,000 00
Sausalito, Municipal Improvement	5	500 00	12	6,000 00
Sausalito, Municipal Improvement	5	1,000 00	24	24,000 00
State of California, Highways	4	1,000 00	350	350,000 00
Terminus School District	6	300 00	4	1,200 00
United States Liberty Loan, second issue	4	1,000 00	----------	------------
United States Liberty Loan, third issue	4	10,000 00	----------	------------
Wilson School District	6	400 00	7	2,800 00
Orland, Municipal Improvement	5	1,000 00	10	10,000 00
Orland, Municipal Improvement	5	500 00	4	2,000 00
			1,386	$1,252,312 50

Insurance Fund.

Held in Trust by the State Treasurer, for the Benefit of the State Compensation Thereon, for the Sixty-ninth Fiscal Year.

Purchased		Redeemed		Balance on hand June 30, 1918		Amount of interest collected	
Number of bonds	Total value	Number of bonds	Total value	Number of bonds	Total value	Gross	Paid into State Compensation Insurance Fund
---------	---------------	1	$1,000 00	14	$14,000 00	$750 00	$750 00
---------	---------------	---------	---------------	35	35,000 00	1,750 00	1,750 00
100	$100,000 00	---------	---------------	100	100 000 00	2.500 00	2,500 00
---------	---------------	1	750 00	38	28,500 00	1,588 11	1,588 11
---------	---------------	1	1,000 00	38	38,000 00	2,117 50	2,117 50
---------	---------------	1	912 50	34	31,025 00	1,596 87	1,596 87
20	10,000 00	---------	---------------	20	10,000 00	250 00	250 00
40	40,000 00	---------	---------------	40	40,000 00	1,000 00	1,000 00
---------	---------------	2	2,000 00	88	88,000 00	4.895 00	4 895 00
---------	---------------	2	2.000 00	68	68,000 00	3.500 00	3.500 00
---------	---------------	---------	---------------	35	8,750 00	525 00	525 00
---------	---------------	---------	---------------	35	17.500 00	1,050 00	1,050 00
---------	---------------	1	250 00	13	3,250 00	210 00	210 00
---------	---------------	1	400 00	8	3,200 00	216 00	216 00
---------	---------------	1	500 00	14	7,000 00	375 00	375 00
---------	---------------	2	2,000 00	70	70,000 00	3,550 00	3,550 00
---------	---------------	1	333 33	12	4,000 00	238 34	238 34
---------	---------------	1	666 66	12	8,000 00	476 66	476 66
---------	---------------	---------	---------------	20	20,000 00	1,000 00	1,000 00
---------	---------------	---------	---------------	8	4,000 00	240 00	240 00
---------	---------------	---------	---------------	40	40,000 00	2,400 00	2,400 00
---------	---------------	---------	---------------	25	25,000 00	1,250 00	1,250 00
---------	---------------	1	1,000 00	6	6,000 00	350 00	350 00
---------	---------------	2	2,000 00	53	53,000 00	2,700 00	2,700 00
---------	---------------	---------	---------------	25	25,000 00	1,250 00	1,250 00
18	18,000 00	---------	---------------	18	18,000 00	450 00	450 00
6	3,000 00	---------	---------------	6	3,000 00	75 00	75 00
6	637 50	---------	---------------	6	637 50	15 96	15 96
18	1,800 00	---------	---------------	18	1,800 00	45 00	45 00
---------	---------------	2	1,000 00	46	23,000 00	1,200 00	1,200 00
---------	---------------	1	1,000 00	21	21,000 00	1,100 00	1,100 00
---------	---------------	1	250 00	6	1,500 00	105 00	105 00
---------	---------------	1	500 00	17	8,500 00	437 50	437 50
---------	---------------	1	500 00	12	6,000 00	325 00	325 00
---------	---------------	1	237 50	37	8,787 50	451 06	451 06
50	50 000 00	---------	---------------	50	50,000 00	---------------	---------------
---------	---------------	---------	---------------	20	30,000 00	1,500 00	1,500 00
---------	---------------	3	3,000 00	60	60,000 00	3,150 00	3,150 00
---------	---------------	2	2,000 00	52	52,000 00	2,700 00	2,700 00
---------	---------------	2	1,000 00	14	7,000 00	480 00	480 00
---------	---------------	1	1,000 00	16	16,000 00	850 00	850 00
---------	---------------	---------	---------------	12	6,000 00	300 00	300 00
---------	---------------	---------	---------------	24	24,000 00	1,200 00	1,200 00
---------	---------------	---------	---------------	350	350,000 00	14,000 00	14,000 00
---------	---------------	1	300 00	3	900 00	72 00	72 00
150	150,000 00	---------	---------------	150	150,000 00	3,000 00	3,000 00
15	150,000 00	---------	---------------	15	150,000 00	---------------	---------------
---------	---------------	1	400 00	6	2,400 00	168 00	168 00
---------	---------------	1	1,000 00	9	9,000 00	500 00	500 00
---------	---------------	1	500 00	3	1,500 00	100 00	100 00
413	$523,437 50	37	$27,500 00	1,812	$1,748,250 00	$68,003 00	$68,003 00

Dissolved Savings Banks Fund.

Transactions in Bonds Held in Trust by the State Treasurer, for the Benefit of the Dissolved Savings Banks Fund, and Collection of Interest Thereon for the Sixty-ninth Fiscal Year.

Title and classification of bonds	Rate of interest	Value of each bond	On hand July 1, 1917		Redeemed		Balance on hand June 30, 1918		Interest collected; paid into dissolved savings banks fund
			Number of bonds	Total value	Number of bonds	Total value	Number of bonds	Total value	
Butte City School Dist.	5	$1,000 00	4	$4,000 00	1	$1,000 00	3	$3,000 00	$175 00
Kern County	4½	1,000 00	33	33,000 00	-----	----------	33	33,000 00	1,485 00
Livermore, Mun. Impt.	4½	1,000 00	1	1,000 00	-----	----------	1	1,000 00	45 00
Manzana School Dist.	6	200 00	4	800 00	1	200 00	3	600 00	48 00
Nuevo School Dist.	6	580 00	4	2,320 00	1	580 00	3	1,740 00	139 20
Rodden School Dist.	6	250 00	9	2,250 00	1	250 00	8	2,000 00	127 50
Tropico School Dist.	5	250 00	7	1,750 00	-----	----------	7	1,750 00	87 50
West Covina School Dist.	5½	500 00	4	2,000 00	-----	----------	4	2,000 00	110 00
Totals	-----	----------	66	$47,120 00	4	$2,030 00	62	$45,090 00	$2,217 20

Nurses Registration Fund.

Bonds Held in Trust by the State Treasurer, for the Benefit of the Nurses Registration Fund.

Title of bonds	Rate of interest	Vale of each bond	Purchased		Balance on hand June 30, 1918	
			Number of bonds	Total value	Number of bonds	Total value
United States Liberty Loan	4¼	$1,000 00	20	$20,000 00	20	$20,000 00

University Fund.

Transactions in Bonds Held in Trust by the State Treasurer, for the Benefit of the University Fund, and Collection of Interest Thereon for the Sixty-ninth Fiscal Year.

Title and classification of bonds	Rate of interest	Value of each bond	On hand July 1, 1917		Balance on hand June 30, 1918		Interest collected	
			Number of bonds	Total value	Number of bonds	Total value	Gross	Paid into University Fund
State of Cal., funded debt 1873	6	$1,000 00	1	$1,000 00	1	$1,000 00		
State of Cal., funded debt 1873	6	500 00	1	500 00	1	500 00		
State of Cal., funded debt 1873	6	60,000 00	1	60,000 00	1	60,000 00		
State of Cal., funded debt 1873	6	200,000 00	1	200,000 00	1	200,000 00		
State of Cal., funded debt 1873	6	150,000 00	1	150,000 00	1	150,000 00		
State of Cal., funded debt 1873	6	30,000 00	1	30,000 00	1	30,000 00		
State of Cal., funded debt 1873	6	1,000 00	24	24,000 00	24	24,000 00		
State of Cal., funded debt 1873	6	1,000 00	1	1,000 00	1	1,000 00		
State of Cal., funded debt 1873	6	8,000 00	1	8,000 00	1	8,000 00		
State of Cal., funded debt 1873	6	160,000 00	1	160,000 00	1	160,000 00		
State of Cal., funded debt 1873	6	500 00	1	500 00	1	500 00		
State of Cal., funded debt 1873	6	116,000 00	1	116,000 00	1	116,000 00		
Total interest collected	----	----------	----	----------	----	----------	$45,000 00	$45,000 00
Endowments as per statutes	----	----------	----	----------	----	----------	4,785 00	4,785 00
			35	$751,000 00	35	$751,000 00	$49,845 00	$49,845 00

Estates of Deceased

Transactions in Bonds Owned by the Estates of Deceased Persons Fund, and Held Amount of Interest Collected Thereon,

Title and classification of bonds	Rate of interest	Value of each bond	On hand July 1, 1917	
			Number of bonds	Total value
Anaheim School District	5	$2,000 00	9	$18,000 00
Cerritos School District	5	250 00	36	9,000 00
Coalinga Union High School	6	500 00	20	10,000 00
Dixie Land School District	6	500 00	14	7,000 00
Dunsmuir, Municipal Improvement	6	250 00	83	20,750 00
Glendora School District	5	1,000 00	34	34,000 00
Graham School District	5	1,000 00	24	24,000 00
Indian Falls School District	6	100 00	30	3,000 00
Laguna School District	6	250 00	8	2,000 00
Lincoln Union High School	5	1,000 00	13	13,000 00
Long Beach School District	5	1,000 00	30	30,000 00
Los Angeles High School District	4	1,000 00	128	128,000 00
Marysville School District	4½	1,000 00	17	17,000 00
Newport Beach, Municipal Improvement	5	1,000 00	33	33,000 00
Pomona City School District	5	1,000 00	21	21,000 00
Portola School District	6	500 00	7	3,500 00
Russell School District	5½	250 00	5	1,250 00
San Francisco Street Railway	5	1,000 00	1	1,000 00
San Francisco Street Railway	5	500 00	1	500 00
San Jacinto High School District	5	1,000 00	25	25,000 00
San Juan School District	5	500 00	--------	------------
Santa Maria, Municipal Improvement	5	1,000 00	25	25,000 00
Tehama, Town of	6	500 00	18	9,000 00
Washington School District	5	1,000 00	30	30,000 00
United States Liberty Loan	4	1,000 00	--------	------------
			612	$465,000 00

Surplus Money

Transactions in Bonds Purchased from the Surplus Money of the General Fund, and and Interest Collected Thereon

Title and classification of bonds	Rate of interest	Value of each bond	On hand July 1, 1917	
			Number of bonds	Total value
Los Angeles City High School District	4½	$1,000 00	114	$114,000 00
Los Angeles City School District	4½	1,000 00	120	120,000 00
State of California, Harbor Improvement	4	1,000 00	--------	------------
State of California, Highways	4	1,000 00	1,151	1,151,000 00
State of California, India Basin	4	1,000 00	625	625,000 00
United States Liberty Loan, first issue	3½	100,000 00	--------	------------
United States Liberty Loan, first issue	3½	50,000 00	--------	------------
United States Liberty Loan, second issue	4	1,000 00	--------	------------
United States Liberty Loan, second issue	4	500 00	--------	------------
United States Liberty Loan, second issue	4	1,000 00	--------	------------
United States Liberty Loan, second issue	4	500 00	--------	------------
United States Liberty Loan, third issue	4¼	10,000 00	--------	------------
United States Liberty Loan, third issue	4¼	5,000 00	--------	------------
United States Liberty Loan, third issue	4¼	1,000 00	--------	------------
			2,010	$2,010,000 00

Persons Fund.

in Trust by the State Treasurer, for the Benefit of the State School Fund, and for the Sixty-ninth Fiscal Year.

Purchased		Redeemed		Balance on hand June 30, 1918		Interest collected	
Number of bonds	Total value	Number of bonds	Total value	Number of bonds	Total value	Paid into School Fund	Paid into Estates of Deceased Persons Fund
-----	-----	1	$2,000 00	8	$16,000 00	$900 00	-----
-----	-----	1	250 00	35	8,750 00	-----	$450 00
-----	-----	-----	-----	14	7,500 00	600 00	-----
-----	-----	-----	-----	14	7,000 00	420 00	-----
-----	-----	5	1,250 00	78	19,500 00	1,245 00	-----
-----	-----	2	2,000 00	32	32,000 00	1,685 00	15 00
-----	-----	1	1,000 00	23	23,000 00	1,200 00	-----
-----	-----	-----	-----	30	3,000 00	180 00	-----
-----	-----	1	250 00	7	1,750 00	120 00	-----
-----	-----	1	1,000 00	12	12,000 00	650 00	-----
-----	-----	10	10,000 00	20	20,000 00	1,500 00	-----
-----	-----	-----	-----	128	128,000 00	5,120 00	-----
-----	-----	2	2,000 00	15	15,000 00	720 00	-----
-----	-----	1	1,000 00	32	32,000 00	1,650 00	-----
-----	-----	3	3,000 00	18	18,000 00	-----	1,050 00
-----	-----	1	500 00	6	3,000 00	195 00	-----
-----	-----	-----	-----	5	1,250 00	41 17	27 58
-----	-----	-----	-----	1	1,000 00	50 00	-----
-----	-----	-----	-----	1	500 00	25 00	-----
-----	-----	-----	-----	25	25,000 00	1,250 00	-----
12	$6,000 00	-----	-----	12	6,000 00	219 17	80 83
-----	-----	-----	-----	25	25,000 00	1,250 00	-----
-----	-----	1	500 00	17	8,500 00	540 00	-----
-----	-----	1	1,000 00	29	29,000 00	-----	1,500 00
13	13,000 00	-----	-----	13	13,000 00	260 00	-----
25	$19,000 00	36	$28,250 00	601	$455,750 00	$19,826 34	$4,373 41

Invested in Bonds.

Held in Trust by the State Treasurer, for the Benefit of the Bond Investment Fund, for the Sixty-ninth Fiscal Year.

Purchased		Redeemed		Balance on hand June 30, 1918		Amount of interest collected		
Number of bonds	Total value	Number of bonds	Total value	Number of bonds	Total value	Gross	General Fund	Bond Investment Fund
-----	-----	3	$3,000 00	111	$111,000 00	$5,062 50	$5,062 50	-----
-----	-----	12	12,000 00	120	120,000 00	5,130 00	5,130 00	-----
350	$350,000 00	-----	-----	350	350,000 00	-----	-----	-----
-----	-----	-----	-----	1 151	1,151,000 00	46,040 00	-----	$46,040 00
-----	-----	-----	-----	625	625,000 00	25,000 00	7,777 78	17,222 22
6	600,000 00	6	600,000 00	-----	-----	5,651 37	5,651 37	-----
1	50,000 00	1	50,000 00					
617	617,000 00	617	617,000 00	-----	-----	-----	-----	-----
1	500 00	1	500 00	-----	-----	-----	-----	-----
153	153,000 00	-----	-----	153	153,000 00	3,070 00	-----	3,070 00
1	500 00	-----	-----	1	500 00			
70	700,000 00	-----	-----	70	700,000 00	-----	-----	-----
3	15,000 00	-----	-----	3	15,000 00	-----	-----	-----
115	115,000 00	-----	-----	115	115,000 00	-----	-----	-----
317	$2,601,000 00	640	$1,282,500 00	3,317	$3,328,500 00	$89,953 87	$23,621 62	$63,382 22

State Treasurer's Contingent Fund.

Expenditures From the State Treasurer's Contingent Fund for the Sixty-ninth Fiscal Year.

July, 1917—	Allen's Press Clipping Bureau	$3 00
	Laundry	3 10
	Telephone	9 95
	Post office box rent	4 00
	Postage	100 00
	Western Union Telegraph Co.	3 15
	State Purchasing Department	74
Aug., 1917—	Allen's Press Clipping Bureau	3 00
	Capital-Sacramento Transfer Van and Storage Co.	1 67
	Laundry	3 70
	Telephone	13 40
	Postage	100 00
	State Purchasing Department	11 95
	Western Union Telegraph Co.	2 30
	Blanche Batcheller, salary	93 55
Sept., 1917—	Allen's Press Clipping Bureau	3 00
	Laundry	3 00
	Telephone	9 55
	Postage	50 00
	State Purchasing Department	1 78
Oct., 1917—	Allen's Press Clipping Bureau	59
	Capital-Sacramento Transfer Van and Storage Co.	2 37
	Laundry	2 70
	Telephone	5 85
	Postage	50 00
	Post office box rent	4 00
	State Purchasing Department	7 16
	Western Union Telegraph Co.	40
Nov., 1917—	Allen's Press Clipping Bureau	2 00
	Laundry	1 65
	Telephone	13 25
	Postage	50 00
	State Purchasing Department	6 51
	M. C. West Co.	12 85
	Western Union Telegraph Co.	2 74
Dec., 1917—	Stockwell Lock and Inspection Co.	15 00
	Allen's Press Clipping Bureau	2 00
	Laundry	2 50
	Telephone	6 35
	Remington Typewriter Co.	40 00
	Western Union Telegraph Co.	55
	Postage	56 00
	State Purchasing Department	5 01
	E. M. Lynch, expenses to San Francisco	8 50
Jan., 1918—	Allen's Press Clipping Bureau	3 00
	Laundry	2 90
	Telephone	12 00
	Remington Typewriter Co.	45 80
	Postage	100 00
	Post office box rent	4 00
	State Purchasing Department	5 01
	Wahl Stationery Co.	26 10
	Western Union Telegraph Co.	58
Feb., 1918—	Allen's Press Clipping Bureau	2 41
	Laundry	2 70
	Telephone	14 25
	Postage	50 00
	Elva M. McMillan, salary	36 00
	State Purchasing Department	10 97
	Underwood Typewriter Co.	4 00
	Western Union Telegraph Co.	35
Mar., 1918—	Allen's Press Clipping Bureau	2 62
	Laundry	2 80
	Telephone	9 45
	Postage	100 00
	State Purchasing Department	10 28
	Woods, Creighton & Morris	3 00

State Treasurer's Contingent Fund—Continued.

Expenditures From the State Treasurer's Contingent Fund for the Sixty-ninth Fiscal Year.

April, 1918—	Allen's Press Clipping Bureau	$2 00
	Laundry	2 20
	Telephone	8 30
	Postage	50 00
	Post office box rent	4 00
	State Purchasing Department	3 61
May, 1918—	Allen's Press Clipping Bureau	2 04
	Laundry	2 10
	Telephone	8 65
	Postage	75 00
	State Purchasing Department	4 48
June, 1918—	Allen's Press Clipping Bureau	3 00
	C. J. Hopkinson	53 80
	Laundry	2 25
	Telephone	8 35
	Postage	75 00
	H. C. Stockwell, time lock	20 00
	State Purchasing Department	10 34
		$1,501 26

State Treasurer's Contingent Fund for Printing.

Sixty-ninth Fiscal Year.

July 31, 1917—	To Department of State Printing	$9 82
Aug. 31, 1917—	To Department of State Printing	203 01
Sept. 30, 1917—	To Department of State Printing	5 47
Oct. 31, 1917—	To Department of State Printing	49 07
Nov. 30, 1917—	To Department of State Printing	10 66
Dec. 31, 1917—	To Department of State Printing	3 80
Jan. 31, 1918—	To Department of State Printing	62 04
Feb. 28, 1918—	To Department of State Printing	12 39
Mar. 31, 1918—	To Department of State Printing	152 04
April 30, 1918—	To Department of State Printing	20 91
May 31, 1918—	To Department of State Printing	8 78
June 30, 1918—	To Department of State Printing	100 71
		$638 70

Insurance

Securities on Hand June 30, 1918, Received Through the State Insurance Certain

Name of company	Location
California Casualty Indemnity Exchange	San Francisco, Cal.
California Mutual Benefit Society	San Francisco, Cal.
California Pacific Title Insurance Company	San Francisco, Cal.
California State Life Insurance Company	Sacramento, Cal.
Casualty Reciprocal Exchange	Kansas City, Mo.
City Abstract Title Insurance Company	San Francisco, Cal.
Employers Indemnity Corporation	Kansas City, Mo.
Fireman's Fund Insurance Company	San Francisco, Cal.
Golden Gate Indemnity Company	San Francisco, Cal.
Great Republic Life Insurance Company	Los Angeles, Cal.
Guardian Casualty and Guaranty Company	Salt Lake City, Utah
Hartford Steam Boiler Inspection and Insurance Company	Hartford, Conn.
Home Fire and Marine Insurance Company of California	San Francisco, Cal.
Los Angeles Title Insurance Company	Los Angeles, Cal.
Metropolitan Life Insurance Company	San Francisco, Cal.
Mutual Indemnity Company	San Francisco, Cal.
New Amsterdam Casualty Company	New York City, N. Y.
New Zealand Insurance Company	Aukland, N. Z.
Oakland Title Insurance and Guaranty Company	Oakland, Cal.
Occidental Life Insurance Company	San Francisco, Cal.
Pacific Coast Casualty Company	San Francisco, Cal.
Pacific Mutual Life Insurance Company	Los Angeles, Cal.
Pacific Surety Company	San Francisco, Cal.
Pioneer Title Insurance Company	San Bernardino, Cal.
Queenland Insurance Company	Sydney, N. S. W., Australia
Southern Surety Company	Muskogee, Oklahoma
Title Guaranty and Trust Company	Los Angeles, Cal.
Title Insurance and Trust Company	Los Angeles, Cal.
Title Insurance and Guarantee Company	San Francisco, Cal.
Union Title Insurance Company	Oakland, Cal.
West Coast-San Francisco Life Insurance Company	San Francisco, Cal.
Western Assurance Company	Toronto, Canada
Western States Life Insurance Company	San Francisco, Cal.
Western Indemnity Company	Dallas, Texas

Securities.

Commissioner, and Held by the State Treasurer for the Protection of Policyholders.

Bonds	Mortgages	Mortgage certificates	Gold coin	Drafts	Total
$44,000 00					$44,000 00
	$5,000 00				5,000 00
	107,800 00				107,800 00
20,000 00	228,500 00				248,500 00
16,000 00					16,000 00
	100,000 00				100,000 00
3,200 00					3,200 00
850,000 00					850,000 00
25,300 00					25,300 00
	508,786 22	$30,000 00			538,786 22
30,000 00			$250 00		30,250 00
2,000 00					2,000 00
250,000 00					250,000 00
		105,000 00			105,000 00
20,000 00					20,000 00
5,000 00					5,000 00
61,000 00					61,000 00
250,000 00					250,000 00
	100,000 00				100,000 00
	602,015 00				602,015 00
25,000 00					25,000 00
	2,207,250 00				2,207,250 00
107,500 00					107,500 00
		100,000 00			100,000 00
225,000 00					225,000 00
53,000 00					53,000 00
110,332 50					110,332 50
	101,000 00				101,000 00
11,000 00	97,100 00				108,100 00
	106 203 33				106,203 33
456,000 00	255,700 00				711,700 00
105,000 00					105 000 00
582,462 50	1,226,000 00				1,808,462 50
27,500 00			872 72	$33,627 28	62,000 00
$3,279,295 00	$5,615,354 55	$235,000 00	$1,122 72	$33,627 28	$9,194,399 55

Debenture Securities.

Securities on Hand June 30, 1918, Deposited by Debenture Companies Under Provisions of Statutes 1905, Chapter CLXIII.

Name of company deposited by	Kind of securities	Value
American Mutual Investment Company	Notes of sundry persons and bonds	$8,636 70
California Bond Corporation of California	Notes of sundry persons and bonds	8,167 00
	Cash	188 00
Total		$16,991 70

Securities Deposited by Industrial Accident Commission.

Securities Deposited with the State Treasurer by the Industrial Accident Commission in Conformity with the Provisions of Section 29 (a) of the Workmen's Compensation, Insurance and Safety Act of the State of California, Chapter 586, Laws of 1917, Effective January 1, 1918.

	Security bonds	Bonds
Adams Express Company	$20,000 00	
Alaska Packers Association	20,000 00	
Albion Lumber Company	20,000 00	
American Can Company	20,000 00	
American Express Company	20,000 00	
American District Telegraph Company of Arizona	20,000 00	
American District Telegraph Company of San Francisco	20,000 00	
American Steel and Wire Company	20,000 00	
Armour & Company		$20,000 00
Atchison, Topeka and Santa Fe Railway Company		20,000 00
Atlas Tank Manufacturing Company	20,000 00	
Baker Iron Works		20,000 00
Bethlehem Shipbuilding Corporation	20,000 00	
Borden Condensed Milk Company	20,000 00	
Butters Divisadero Company	20,000 00	
California Cap Company	20,000 00	
California Packing Corporation		20,000 00
California Portland Cement Company	20,000 00	
California Street Cable Railroad Company	20,000 00	
California Trojan Powder Company	20,000 00	
California Western Railway and Navigation Company	20,000 00	
City Electric Company	20,000 00	
Coast Counties Gas and Electric Company	20,000 00	
Coast Manufacturing and Supply Company		20,000 00
Cudahy Packing Company	20,000 00	
Dolbeer & Carson Lumber Company		20,000 00
Eastman Kodak Company		20,000 00
Eureka Sash Door and Moulding Mill		20,000 00
Forderer Cornice Works	20,000 00	
Fort Bragg Electric Company	20,000 00	
Fresno City Water Company	20,000 00	
Fresno Traction Company	20,000 00	
Fruit Growers Supply Company	20,000 00	
General Electric Company	20,000 00	
Glen Blair Redwood Company	20,000 00	
Goodrich Rubber Company (B. F.)	20,000 00	
Great Western Power Company	20,000 00	
Hale Bros., Inc.		20,000 00
Hammond Lumber Company		20,000 00
Henry Cowell Lime and Cement Company	20,000 00	
Hobbs, Wall & Company	20,000 00	
Home Telephone and Telegraph Company (Pasadena)	20,000 00	
Howland & Dewey Company	20,000 00	
Huntington Lake Hotel Company	20,000 00	
Imperial Telephone Company	20,000 00	
International Harvester Company of America		20,000 00
Iron Mountain Railway Company	20,000 00	
Lacey Company (The H. G.)	20,000 00	
Leland Stanford Jr. University	20,000 00	
Limoneira Company	20,000 00	
Little River Redwood Company	20,000 00	
Little Valley Lumber Company	20,000 00	
Llewelyn Iron Works	20,000 00	
Los Angeles District Telegraph Company	20,000 00	
Los Angeles Gas and Electric Corporation	20,000 00	
Los Angeles Railway Corporation	20,000 00	
Los Angeles and Salt Lake Railroad Company	20,000 00	
Madera Sugar Pine Company		20,000 00
Mendocino Lumber Company	20,000 00	
Midland Counties Public Service Corporation	20,000 00	
Mountain Copper Company, Ltd.	20,000 00	
Mt. Whitney Power and Electric Company	20,000 00	
Mutual Life Insurance Company of New York	20,000 00	

Securities Deposited by Industrial Accident Commission—Continued.

Securities Deposited with the State Treasurer by the Industrial Accident Commission in Conformity with the Provisions of Section 29 (a) of the Workmen's Compensation, Insurance and Safety Act of the State of California, Chapter 586, Laws of 1917, Effective January 1, 1918—Continued.

	Security bonds	Bonds
McCloud River Lumber Company	$20,000 00	
North Star Mines Company	20,000 00	
Northwestern Pacific Railroad Company	20,000 00	
Noyo Land and Cattle Company	20,000 00	
Oakland Meat and Packing Company	20,000 00	
Oceanic Steamship Company		$20,000 00
Ontario and Upland Lumber Company	20,000 00	
Pacific Coast Coal Company		20,000 00
Pacific Coast Railway Company		20,000 00
Pacific Electric Railway Company	20,000 00	
Pacific Fruit Express Company	20,000 00	
Pacific Gas and Electric Company	20,000 00	
Pacific Lumber Company		20,000 00
Pacific Manufacturing Company	20,000 00	
Pacific Telephone and Telegraph Company	20,000 00	
Pajaro Valley Consolidated Railroad Company		20,000 00
Palmer & McBryde		21,000 00
Patten & Davis Lumber Company	20,000 00	
Pedersen, L. A.		20,000 00
Peninsular Railway Company	20,000 00	
Penn Mining Company		20,000 00
Plymouth Consolidated Gold Mines, Ltd.	20,000 00	
Postal Telegraph Cable Company	20,000 00	
Prince & Company (H. G.)	20,000 00	
Pullman Company		20,000 00
Sacramento Valley Telephone Company	20,000 00	
San Diego and Coronado Ferry Company		25,000 00
San Diego Electric Railway Company		25,000 00
Sanger Lumber Company	20,000 00	
San Joaquin and Eastern Railroad Company	20,000 00	
San Joaquin Light and Power Corporation	20,000 00	
San Jose Railroads	20,000 00	
Santa Barbara Gas and Electric Company	20,000 00	
Santa Barbara and Suburban Railway Company	20,000 00	
Schaw-Batcher Company Pipe Works	20,000 00	
Selby Smelting and Lead Company		20,000 00
Sierra and San Francisco Power Company	20,000 00	
Southern California Edison Company	20,000 00	
Southern California Gas Company		20,000 00
Southern California Hardwood and Manufacturing Company	20,000 00	
Southern California Telephone Company	20,000 00	
Southern Pacific Company	20,000 00	
Southern Pacific Milling Company	20,000 00	
Southwestern Shipbuilding Company	20,000 00	
Standard Oil Company of California	20,000 00	
Stockton Electric Railroad Company	20,000 00	
Spreckels Securities Company (J. D. and A. B.)		20,000 00
Spreckels Sugar Company		20,000 00
Standard Lumber Company		20,000 00
Sugar Pine Railway Company	20,000 00	
Sunlit Fruit Company		20,000 00
Sunset Railway Company	20,000 00	
Swayne Lumber Company	20,000 00	
Swift & Company	20,000 00	
Tonopah Belmont Development Company	20,000 00	
Underwriters Fire Patrol	20,000 00	
Union Lumber Company	20,000 00	
Union Oil Company of California	20,000 00	
United Railroads of San Francisco	20,000 00	
U. S. Smelting, Refining and Mining Company	20,000 00	
U. S. Smelting, Refining and Mining Exploration Company	20,000 00	

Securities Deposited by Industrial Accident Commission—Continued.

Securities Deposited with the State Treasurer by the Industrial Accident Commission in Conformity with the Provisions of Section 29 (a) of the Workmen's Compensation, Insurance and Safety Act of the State of California, Chapter 586, Laws of 1917, Effective January 1, 1918.

	Security bonds	Bonds
United States Steel Products Company	$20,000 00	
Valley Electric and Supply Company		$20,000 00
Visalia Electric Railroad Company	20,000 00	
Welsbach Street Lighting Company of America	20,000 00	
Wells Fargo & Company	20,000 00	
Western Electric Company	20,000 00	
Weed Lumber Company		20,000 00
Western Meat Company	20,000 00	
Western Pacific Railroad Company	20,000 00	
Western Pipe and Steel Company	20,000 00	
Western Union Telegraph Company	20,000 00	
Whiting Mead Commercial Company	20,000 00	
Totals	$2,100,000 00	$631 000 00

Trust

Trust Securities on Hand June 30, 1918, Received Through the State Superintendent Trustees, Etc., Under Section 96 of the

Companies	Court	
	Bonds	Mortgages
Anglo-California Trust Co., San Francisco	--------------	$100,000 00
Bank and Trust Company of Central California, Fresno	--------------	49,500 00
Bank of Italy, San Francisco	$100,000 00	--------------
Berkeley Bank of Savings and Trust Company, Berkeley	28,000 00	22,500 00
California Savings Bank, Sacramento	--------------	50,000 00
Citizens Trust and Savings Bank, Los Angeles	--------------	100,000 00
Crown City Trust and Savings Bank, Pasadena	15,500 00	35,000 00
First Federal Trust Company, San Francisco	180,000 00	--------------
Garden City Bank and Trust Company, San Jose	--------------	50,000 00
Guaranty Trust and Savings Bank, Los Angeles	--------------	--------------
Hellman Commercial Trust and Savings Bank, Los Angeles	101,000 00	--------------
Long Beach Savings Bank and Trust Company, Long Beach	51,000 00	--------------
Los Angeles Trust and Savings Bank, Los Angeles	--------------	417,500 00
Mercantile Trust Company of San Francisco, San Francisco	75,000 00	425,000 00
Oakland Bank of Savings, Oakland	150,000 00	--------------
Orange County Trust and Savings Bank, Santa Ana	29,500 00	20,500 00
Pasadena Trust and Savings Bank, Pasadena	--------------	--------------
Peoples Trust and Savings Bank, Riverside	6,000 00	44,500 00
Sacramento Valley Bank and Trust Company, Sacramento	--------------	60,000 00
Santa Barbara Savings and Loan Bank, Santa Barbara	--------------	--------------
Santa Barbara Trust Company, Santa Barbara	50,000 00	--------------
Savings Union Bank and Trust Company, San Francisco	227,000 00	--------------
Security Trust Company, Bakersfield	51,000 00	--------------
Security Trust and Savings Bank, Los Angeles	200,000 00	--------------
Southern Trust Company, Los Angeles	100,000 00	--------------
Southern Trust and Commerce Bank, San Diego	--------------	100,000 00
Spalding Company, Los Angeles	64,000 00	--------------
Title Guarantee and Trust Company, Los Angeles	100,000 00	--------------
Title Insurance and Trust Company, Los Angeles	160,000 00	50,000 00
Union Bank and Trust Company of Los Angeles, Los Angeles	54,500 00	--------------
Union Trust Company, San Diego	--------------	50,000 00
Union Trust Company, San Francisco	--------------	500,000 00
Union Trust and Savings Bank, Pasadena	150,000 00	--------------
Totals	$1,892,500 00	$2,074,500 00

Securities.

of Banks in Conformity with the Law Authorizing Corporations to Act as Executors, Bank Act, Statutes of 1913, Chapter 104.

trusts		Private trusts				Total
Mortgage certificates	Gold coin	Bonds	Mortgages	Mortgage certificates	Gold coin	
---	---	$65,000 00	$43,000 00	---	---	$208,000 00
---	$500 00	9,000 00	39,800 00	---	$300 00	99,100 00
---	---	100,000 00	---	---	---	200,000 00
---	---	26,000 00	25,000 00	---	---	101,500 00
---	---	---	50,000 00	---	---	100,000 00
---	---	---	100,000 00	---	---	200,000 00
---	---	---	50,000 00	---	---	100,500 00
---	---	100,000 00	---	---	---	280,000 00
---	---	27,000 00	25,500 00	---	---	102,500 00
$150,000 00	---	---	100,000 00	---	---	250,000 00
---	---	29,000 00	71,000 00	---	---	201,000 00
---	---	52,000 00	---	---	---	103,000 00
82,500 00	---	---	10,000 00	$90,000 00	---	600,000 00
---	---	100,000 00	---	---	---	600,000 00
---	---	100,000 00	---	---	---	250,000 00
---	---	31,500 00	18,500 00	---	---	100,000 00
50,000 00	---	---	---	50,000 00	---	100,000 00
---	---	10,500 00	39,500 00	---	---	100,500 00
---	---	50,000 00	---	---	---	110,000 00
50,000 00	---	---	---	50,000 00	---	100,000 00
---	---	27,000 00	---	25,000 00	---	102,000 00
---	---	100,000 00	---	---	---	327,000 00
---	---	---	50,000 00	---	---	101,000 00
100,000 00	---	100,000 00	---	---	---	400,000 00
---	---	---	---	100,000 00	---	200,000 00
---	---	---	100,000 00	---	---	200,000 00
44,000 00	---	---	---	100,000 00	---	208,000 00
---	---	---	100,000 00	---	---	200,000 00
300,000 00	---	52,000 00	---	48,000 00	---	610,000 00
45,500 00	---	103.300 00	---	---	---	203,300 00
---	---	8,000 00	44,750 00	---	---	102,750 00
---	---	100,000 00	---	---	---	600,000 00
---	---	50,000 00	50,000 00	---	---	250,000 00
$822,000 00	$500 00	$1,240,300 00	$917,050 00	$463,000 00	$300 00	$7,410,150 00

Balances in State Treasury.

Balances in State Treasury on the Last Business Day of Each Month during the Sixty-eighth and Sixty-ninth Fiscal Years.

	Gold coin	Silver coin	Nickels and pennies	Gold certificates and currency
1916—July 31	$3,160,315 00	$4,785 95	$61 59	$1,300,405 00
August 31	3,929,385 00	3,259 15	50 95	1,300,396 00
September 30	3,678,275 00	4,778 50	42 98	1,300,055 00
October 31	2,743,480 00	3,421 50	30 55	1,240,765 00
November 29	2,115,065 00	5,286 80	69 72	1,200,400 00
December 30	1,466,925 00	3,688 50	61 91	1,202,181 00
1917—January 31	3,347,400 00	6,718 75	95 64	1,200,720 00
February 28	6,551,180 00	5,160 25	87 69	1,700,053 00
March 31	5,102,300 00	1,990 55	70 53	2,200,013 00
April 30	3,847,315 00	4,321 20	53 46	1,800,011 00
May 31	2,915,295 00	2,438 55	43 28	1,306,258 00
June 30	2,639,045 00	5,601 65	35 02	701,859 00
July 31	2,189,525 00	4,037 75	24 54	500,000 00
August 31	3,447,400 00	3,545 65	62 35	3,150,102 00
September 29	3,448,255 00	1,821 25	54 88	3,400,327 00
October 31	2,446,560 00	4,352 75	48 80	2,600,757 00
November 30	2,016,900 00	2,845 75	39 81	661,295 00
December 31	1,379,440 00	5,113 25	30 84	200,285 00
1918—January 31	1,506,440 00	3,224 70	20 73	203,790 00
February 28	1,538,980 00	5,983 80	113 03	284,870 00
March 30	1,647,955 00	4,417 95	106 31	451,405 00
April 30	1,246,150 00	2,790 85	99 13	127,550 00
March 31	469,410 00	5,064 00	89 22	189,283 00
June 29	407,810 00	3,715 70	87 67	71,576 00

Balances in State Treasury—Continued.

Balances in State Treasury on the Last Business Day of Each Month during the Sixty-eighth and Sixty-ninth Fiscal Years.

	Deposited in banks	Exchange	Total available cash and balance
1916—July 31	$9,247,565 00	$1,036,806 32	$14,749,938 86
August 31	9,267,365 00	6,360,037 19	20,860,493 29
September 30	9,190,915 00	1,898,220 93	16,072,287 41
October 31	9,298,615 00	1,525,398 37	14,811,710 42
November 29	9,210,925 00	921,515 30	13,453,261 82
December 30	9,077,475 00	2,261,069 93	14,011,401 34
1917—January 31	8,677,675 00	2,235,348 06	15,467,957 45
February 28	8,476,075 00	3,506,189 17	20,238,745 11
March 31	10,278,075 00	1,062,184 21	18,644,633 29
April 30	10,377,775 00	306,077 67	16,335,553 33
May 31	10,610,775 00	1,424,688 54	16,259,498 37
June 30	10,922,775 00	453,533 29	14,722,848 96
July 31	11,220,425 00	487,041 96	14,401,054 25
August 31	11,561,225 00	3,378,972 86	21,541,307 86
September 29	11,532,775 00	152,561 13	18,535,794 26
October 31	12,379,775 00	400,973 76	17,832,467 31
November 30	12,332,275 00	617,041 95	15,630,397 51
December 31	12,383,625 00	846,398 61	14,814,892 70
1918—January 31	12,778,425 00	2,018,647 51	16,510,547 94
February 28	13,216,275 00	8,194,266 61	23,240,488 44
March 30	13,478,975 00	3,382,926 60	18,965,785 86
April 30	13,583,725 00	2,877,911 06	17,838,226 04
May 31	13,656,725 00	2,340,339 35	16,660,910 57
June 29	13,895,725 00	510,310 53	14,889,224 90

Volume of Business.

Receipts, Payments, Transfers and Balances Condensed for the Sixty-eighth and Sixty-ninth Fiscal Years.

SIXTY-EIGHTH FISCAL YEAR.

Balance on hand July 1, 1916	$14,975,233 12
Cash receipts	33,819,867 73
Transfer receipts	10,153,862 94
Cash and transfer receipts	$58,948,963 79
Cash payments	$34,072,251 89
Transfer payments	10,153,862 94
Cash and transfer payments	$44,226,114 83
Balance on hand July 30, 1917	$14,722,848 96

SIXTY-NINTH FISCAL YEAR.

Balance on hand July 1, 1917	$14,722,848 96
Cash receipts	42,914,158 53
Transfer receipts	11,187,580 51
Cash and transfer receipts	$68,824,588 00
Cash payments	$42,747,782 59
Transfer payments	11,187,580 51
Cash and transfer payments	$53,935,363 10
Balance on hand June 29, 1918	$14,889,224 90
Total cash receipts	$76,734,026 26
Total cash payments	76,820,034 48
Total transfer receipts	$21,341,443 45
Total transfer payments	21,341,443 45

Monthly Statement.

Monthly Receipts and Payments during the Sixty-eighth Fiscal Year.

Month	Receipts	Payments
1916—July	$1,550,252 75	$1,775,547 01
August	8,347,285 19	2,236,730 76
September	678,434 74	5,466,640 62
October	1,234,206 15	2,494,783 14
November	557,256 40	1,915,705 00
December	3,203,135 97	2,644,996 45
1917—January	3,826,235 20	2,369,679 09
February	8,635,979 75	3,865,192 09
March	800,850 93	2,394,962 75
April	1,672,944 64	3,982,024 60
May	2,549,393 59	2,625,448 55
June	763,892 42	2,300,541 83
Totals	$33,819,867 73	$34,072,251 89

Monthly Statement.

Monthly Receipts and Payments during the Sixty-ninth Fiscal Year.

Month	Receipts	Payments
1917—July	$1,906,044 24	$2,227,838 95
August	12,372,907 62	5,232,654 01
September	2,724,516 84	5,730,030 44
October	1,604,737 55	2,308,064 50
November	678,356 07	2,880,425 87
December	3,385,152 27	4,200,657 08
1918—January	3,876,981 55	2,181,326 31
February	8,982,735 56	2,252,795 06
March	1,120,258 40	5,394,960 98
April	1,349,055 84	2,476,615 66
May	3,390,260 61	4,567,576 08
June	1,523,151 98	3,294,837 65
Totals	$42,914,158 53	$42,747,782 59

Warrants.

Warrants Drawn, Paid, Cancelled and Outstanding during the Sixty-eighth and Sixty-ninth Fiscal Years.

Outstanding July 1, 1916	$793,752 83
Drawn during the sixty-eighth fiscal year	34,886,139 73
	$35,679,892 56
Paid during sixty-eighth fiscal year	$23,072,251 89
Canceled during sixty-eighth fiscal year	21,605 42
	$34,093,857 31
Outstanding July 1, 1917	$1,586,635 25
Drawn during sixty-ninth fiscal year	43,008,663 47
	$44,594,698 72
Paid during sixty-ninth fiscal year	$42,747,782 59
Canceled during sixty-ninth fiscal year	152,097 28
	$42,899,879 87
Outstanding July 1, 1918	$1,694,818 85
Drawn during sixty-eighth and sixty-ninth fiscal years	$77,894,803 20
Paid during sixty-eighth and sixty-ninth fiscal years	$76,820,034 48
Canceled during sixty-eighth and sixty-ninth fiscal years	173,702 70
Total paid and canceled	$76,993,737 18

Warrants Cancelled.

Warrants Cancelled during the Sixty-eighth and Sixty-ninth Fiscal Years.

Date of issue	Warrant number	To whom payable	Fund	Amount	Date canceled
July 1,'15	113	Ralph C. Greenough	School Tch. Ret. Salary	$6 66	July 18,'16
July 1,'15	235	Elizabeth Rogers	School Tch. Ret. Salary	30 00	July 18,'16
July 1,'15	242	Henrietta C. Simpson	School Tch. Ret. Salary	65 00	July 18,'16
July 1,'15	55	Grace E. Clark	School Tch. Ret. Salary	16 83	July 18,'16
July 1,'15	1111	Francis Bruguiere	Printing	50	July 18,'16
July 1,'15	29	Imelda E. Brooks	School Tch. Ret. Salary	65 00	July 27,'16
July 22,'15	1757	Capital Paint Company	General	1 40	July 27,'16
July 27,'15	1961	Sophie Taylor	School Tch. Ret. Salary	2 00	July 27,'16
Aug. 14,'15	3711	F. T. Davenport Company	Printing	4 00	Sept. 11,'16
July 28,'15	2026	J. H. Turner	General	9 12	Sept. 11,'16
Aug. 10,'15	3356	Dr. Irving Beattie	General	2 50	Sept. 11,'16
Aug. 17,'15	3798	A. H. Thomas	General	3 03	Sept. 11,'16
Aug. 18,'15	3968	Com'l Bank of Madera	General	60 00	Sept. 11,'16
Aug. 21,'15	4215	C. T. Wallace	General	21 90	Sept. 11,'16
Aug. 23,'15	4371	Stockton Record	General	7 85	Sept. 11,'16
Aug. 28,'15	4691	Fox Bros.	General	60	Sept. 11,'16
Aug. 28,'15	4692	S. H. Rautz, M.D.	General	6 00	Sept. 11,'16
Aug. 28,'15	4695	Jas. Loverich	General	3 75	Sept. 11,'16
Aug. 28,'15	4698	Robt. Brown	General	1 31	Sept. 11,'16
Aug. 21,'15	4239	Spokane, Port. & S. Ry.	General	63 80	Sept. 11,'16
Sept. 2,'15	5477	Spokane, Port. & S. Ry.	General	46 80	Sept. 11,'16
Sept. 17,'15	6722	Orange Co. S. & T. Co.	General	175 00	Oct. 9,'16
Sept. 21,'15	7000	A. T. Maguire	General	7 27	Oct. 9,'16
Sept. 22,'15	7187	Schmitt, Bachmann Co.	Supt. Cap. Bldg. & G.	1 75	Oct. 9,'16
Oct. 6,'15	8784	Dr. Barton J. Powell	General	10 00	Oct. 9,'16
Oct. 1,'15	8367	Sara F. O'Donnell	School Tch. Ret. Salary	65 00	Oct. 9,'16
Oct. 1,'15	8430	Nellie F. Sullivan	School Tch. Ret. Salary	114 00	Oct. 9,'16
Oct. 1,'15	8469	Ethel F. Williamson	School Tch. Ret. Salary	125 00	Oct. 9,'16
Oct. 1,'15	8450	Mrs. A. C. Walden	School Tch. Ret. Salary	65 00	Oct. 9,'16
Oct. 13,'15	9213	J. C. Kunshaw	General	4 00	Nov. 10,'16
Oct. 13,'15	9223	Fashion Riding Academy	General	28 50	Nov. 10,'16
Oct. 15,'15	9411	Pacific Coast Casualty Co.	General	15 00	Nov. 10,'16
Oct. 18,'15	9542	John S. Dufton	General	42 07	Nov. 10,'16
Oct. 25,'15	10198	Dr. Lawrence Welti	General	6 00	Nov. 10,'16
Oct. 28,'15	10357	A. H. Thomas	General	5 50	Nov. 10,'16
Nov. 4,'15	11516	Citizens Truck Company	General	24 06	Nov. 10,'16
Nov. 4,'15	11366	C. F. Guenther	Receivers'	4 84	Nov. 10,'16
Nov. 12,'15	11991	Yolo County	General	83 96	Nov. 24,'16
Nov. 16,'15	12470	Wm. M. Stevens	General	7 00	Nov. 24,'16
Nov. 19,'15	12753	J. R. Colburn, M.D., dec'd.	General	10 00	Nov. 24,'16
Nov. 19,'15	12756	William M. Lewis, M.D.	General	22 50	Nov. 24,'16
Nov. 24,'15	12923	Clerk of San Diego County	General	77 02	Nov. 24,'16
Nov. 24,'15	13001	City of Roseville	General	49 28	Nov. 24,'16
Dec. 6,'15	14290	Hans C. Boysen	General	8 00	Dec. 14,'16
Dec. 8,'15	14558	S. E. Simmons, M.D.	General	2 50	Dec. 14,'16
Dec. 8,'15	14592	Phoenix Milling Company	General	2 13	Dec. 14,'16
Dec. 11,'15	14779	Halloran & Hession	General	7 00	Dec. 14,'16
Dec. 11,'15	14789	Halloran & Hession	General	1 75	Dec. 14,'16
Dec. 13,'15	15049	Panama Soap Company	Printing	3 40	Dec. 14,'16
Dec. 21,'15	15662	Treasurer Yolo County	School	17,997 50	Dec. 22,'16
Jan. 3,'16	16829	Annie Anderson	School Tch. Ret. Salary	65 00	Jan. 10,'17
Dec. 24,'15	15842	Fred Harvey	General	16 80	Jan. 10,'17
Dec. 16,'15	15195	Ernest C. Meyer	General	13 20	Jan. 10,'17
Dec. 31,'15	16810	Justice Court, San Fran.	General	42 60	Jan. 10,'17
Jan. 7,'16	17692	L. B. Mallory	General	20	Jan. 10,'17
Jan. 7,'16	17681	A. F. Shartel	General	20	Jan. 10,'17
Jan. 7,'16	17693	H. B. Miller	General	20	Jan. 10,'17
Jan. 5,'16	17430	O'Connell & Davis	General	3 50	Jan. 10,'17
Jan. 14,'16	18389	Linda Follette	General	1 65	Jan. 30,'17
Jan. 17,'16	18763	Capitol Sewer Pipe Works	General	2 61	Jan. 30,'17
Jan. 26,'16	19571	Campbell Telephone Co.	General	23 75	Jan. 30,'17
Jan. 28,'16	19877	S. F., Napa & Calistoga Ry.	General	200 00	Jan. 30,'17

Warrants Cancelled—Continued.

Warrants Cancelled during the Sixty-eighth and Sixty-ninth Fiscal Years.

Date of issue	Warrant number	To whom payable	Fund	Amount	Date canceled
Jan. 28,'16	19878	S. F., Napa & Calistoga Ry.	General	$110 00	Jan. 30,'17
Feb. 1,'16	20674	The Old Bank (Hanford)	General	60 00	Feb. 13,'17
Feb. 1,'16	20375	Smeltzer Home T. & T. Co.	General	30 00	Feb. 13,'17
Feb. 7,'16	21080	Bank of Cambria	General	70 00	Feb. 13,'17
Feb. 7,'16	21085	Los Gatos Ice, G. & E. Co.	General	100 00	Feb. 13,'17
Feb. 8,'16	21207	Imperial Valley Sav. Bank	General	15 00	Feb. 13,'17
Feb. 14,'16	21430	Producers Savings Bank	General	75 00	Mar. 8,'17
Feb. 24,'16	22351	H. H. Blue	General	25 00	Mar. 8,'17
Mar. 3,'16	23324	Pacific Trans. V. & T. Co.	General	12 74	Mar. 8,'17
Mar. 3,'16	23352	Alpaugh Tel. & Tel. Co.	General	40 00	Mar. 8,'17
Feb. 14,'16	21583	Penn Mutual Life Ins. Co.	General	30 00	Mar. 8,'17
Mar. 7,'16	23706	Yolo County	Motor Vehicle	469 10	Mar. 8,'17
Mar. 13,'16	24187	City of Grass Valley	General	64 14	Mar. 8,'17
Mar. 15,'16	24367	City of Roseville	General	49 27	Mar. 27,'17
Mar. 9,'16	23769	Central Drug Company	General	2 55	Mar. 27,'17
Mar. 9,'16	23853	Kimball, Upson Company	General	4 50	Mar. 27,'17
Mar. 24,'16	25157	Mary E. Schultz	School Tch. Permanent	1 00	Mar. 27,'17
April 13,'16	26246	Eliza V. Dow	School Tch. Ret. Salary	125 00	April 10,'17
April 3,'16	26308	Nellie C. Haswell	School Tch. Ret. Salary	125 00	April 10,'17
April 10,'16	27181	Searchlight W. Tel. Co.	General	50 00	April 10,'17
April 10,'16	27182	Sav. Bk. Huntington Bch.	General	60 00	April 10,'17
April 29,'16	28888	Geo. D. Murray	General	166 65	May 9,'17
May 3,'16	29490	Abel W. Johnson	General	5 00	May 9,'17
May 1,'16	29432	Gertrude Lofthouse	School Tch. Permanent	1 00	May 9,'17
May 1,'16	29460	Jane A. Witherly	School Tch. Permanent	1 00	May 9,'17
May 31,'16	31505	George D. Murray	General	163 65	June 8,'17
July 1,'16	226	Mrs. E. M. McGinnis	School Tch. Ret. Salary	102 61	July 6,'17
July 26,'16	2256	German Hospital	General	9 50	Aug. 8,'17
Aug. 7,'16	3870	Jno. C. Argyron	Estates Dec'd Persons	44 84	Aug. 8,'17
Aug. 7,'16	3871	Kalliopi A. Stanellow	Estates Dec'd Persons	44 84	Aug. 8,'17
Aug. 7,'16	3872	Theodora A. Zenebisi	Estates Dec'd Persons	44 84	Aug. 8,'17
Aug. 7,'16	3873	Dorothya A. Zenebisi	Estates Dec'd Persons	44 84	Aug. 8,'17
Aug. 4,'16	3597	Frank Simpson, Jr.	General	22 80	Sept. 8,'17
Aug. 23,'16	4961	Nicholas Peters	Estates Dec'd Persons	59 03	Sept. 8,'17
Sept. 19,'16	7639	James Massey	Estates Dec'd Persons	101 12	Oct. 8,'17
Sept. 30,'16	8678	W. C. Miller	General	5 00	Oct. 8,'17
Oct. 7,'16	10053	Tourist Garage	General	2 15	Oct. 8,'17
Oct. 3,'16	9386	Mrs. Emma F. Church	School Tch. Ret. Salary	65 00	Oct. 8,'17
Oct. 3,'16	9480	Alice C. Gregg	School Tch. Ret. Salary	125 00	Oct. 8,'17
Oct. 14,'16	10702	Nicholls Loomis Company	General	65 70	Nov. 8,'17
Oct. 26,'16	11523	Justice Ct., 3d Tp., Fresno	Highway	94 50	Nov. 8,'17
Nov. 13,'16	13208	Tourist Garage	General	90	Dec. 7,'17
Jan. 5,'17	18798	Laura T. Fowler	School Tch. Ret. Salary	125 00	Jan. 9,'18
Jan. 5,'17	18898	Ellen M. Keaton	School Tch. Ret. Salary	65 00	Jan. 9,'18
Jan. 5,'17	18831	Estate of Jas. Hamilton	School Tch. Ret. Salary	89 67	Jan. 9,'18
Jan. 12,'17	19847	L. B. Mallory	General	20	Feb. 7,'18
Mar. 6,'17	26974	Berndt Widell	General	15 00	Mar. 7,'18
Mar. 28,'17	29033	J. A. Johnston, Warden	General	60 00	April 8,'18
April 5,'17	30449	S. T. Black	School Tch. Ret. Salary	125 00	April 8,'18
April 5,'17	30503	Estate Kate E. Conger	School Tch. Ret. Salary	3 61	April 8,'18
April 5,'17	30565	Estate Laura T. Fowler	School Tch. Ret. Salary	13 59	April 8,'18
April 5,'17	30743	Mary Isabel Morgan	School Tch. Ret. Salary	65 00	April 8,'18
May 3,'17	34581	Riverside Tran. V. & S. Co.	General	75	May 6,'18
May 16,'17	35409	California Trans. Co.	School Book	1 34	June 7,'18
May 31,'17	36431	Mrs. Clara D. Baker	General	33 85	June 7,'18
June 1,'17	36032	Comm. Off. Hosp. D. No. 5	General	150 00	June 7,'18
June 4,'17	37104	Riverside Tran. V. & S. Co.	General	1 00	June 7,'18
June 16,'17	37732	Treasurer Los Angeles Co.	General	64,637 24	June 24,'18
June 19,'17	27876	Treasurer Los Angeles Co.	General	85,878 36	June 24,'18
			Total	$173,702 70	

Bonded Indebtedness.

Bonded Indebtedness and Warrants Outstanding June 29, 1918.

Bonded indebtedness—	
*6% Funded Debt Bonds of 1873, act 1870	$2,277,500 00
4% Seawall Bonds, act 1903	675,000 00
4% San Francisco Harbor Improvement Bonds, act 1909	9,000,000 00
4% State Highway Bonds, act 1909	17,600,000 00
4½% University of California Building Bonds, act 1915	1,800,000 00
4% San Francisco State Building Bonds, act 1913	960,000 00
4% India Basin Bonds, act 1909	690,000 00
4% San Francisco Harbor Improvement Bonds, act 1913	1,350,000 00
4½% State Highway Bonds, act 1915	5,011,000 00
	$39,363,500 00
Warrants outstanding (not presented)—	
Sacramento and San Joaquin Drainage District Fund No. 1	$3,666 66
Sacramento and San Joaquin Drainage District Fund No. 2	3,693 37
Sacramento and San Joaquin Drainage District Fund No. 3	24,254 38
Sacramento and San Joaquin Drainage District Fund No. 4	114,404 52
Sacramento and San Joaquin Drainage District Fund No. 5	7,914 10
Sacramento and San Joaquin Drainage District Fund No. 6	547,921 07
San Francisco Harbor Improvement Fund	4,676 17
Fish and Game Preservation Fund	15,935 53
Real Estate Commissioner's Fund	80 00
Purchasing Department Fund	287 71
Compensation Insurance Fund	25,321 11
Library Fund	5,835 67
San Jose Normal School Contingent Fund	198 55
Southern California Hospital Contingent Fund	4,463 41
Veterans' Home, Support and Maintenance Fund	15,195 87
Printing Fund	359 71
Napa Hospital Contingent Fund	209 38
Insurance Commissioner's Special Fund	1,910 00
Accident Prevention Fund	4,983 31
School Land Fund	500 00
School Teachers' Permanent Fund	522 80
Fish Exchange Fund	141 29
Motor Vehicle Fund	38,870 18
School Teachers' Retirement Salary Fund	582 31
Medical Examiners' Contingent Fund	1,520 25
Department of Engineering Revolving Fund	3,731 25
Agricultural Society Contingent Fund	325 00
California Stallion Registration Board Contingent Fund	240 00
California Polytechnic School Contingent Fund	657 66
Vocational Education Fund	1,496 24
Market Commission Fund	1,302 89
Meat Hygiene Fund	212 50
Corporation Commission Fund	3,766 65
Veterinary Medicine Examiners' Fund	7 25
San Francisco State Building Interest and Sinking Fund	20,000 00
Highway Interest and Sinking Fund	400,000 00
Court of Appeal Second District Library Fund	16 00
Interest and Sinking Fund	70,717 50
Cattle Protection Fund	1,665 52
Adult Blind Fund	1,945 54
Nurses' Registration Fund	685 95
Banking Fund	7,381 32
School Book Fund	7,583 20
Second Highway Fund	90,301 26
General Fund	259,335 77
	$1,694,818 85
Total bonded indebtedness	$39,363,500 00
Total warrants outstanding	1,694,818 85
	$41,058,318 85

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*These bonds are held by the State of California for the benefit of the School Fund ($1,526,500) and the University Fund ($751,000). Interest thereon is paid under provision of an act of the legislature, March 3, 1893.

Banks Holding State Deposits.

List of Banks which held State Deposits on June 30, 1918.

Bank	Amount
Alameda National Bank	$10,000
Alameda Savings Bank	73,000
Amador Valley Savings Bank, Pleasanton	12,500
American National Bank, Pomona	25,000
American National Bank, San Bernardino	26,000
American National Bank, San Francisco	45,000
Anaheim National Bank	8,000
Analy Savings Bank, Sebastopol	12,500
Anglo & London Paris National Bank, San Francisco	1,200,000
Anglo California Trust Company, San Francisco	500,000
Antioch Bank of Savings	10,000
Auburn Savings Bank	15,500
Bank of California, N. A., San Francisco	450,000
Bank of Ceres	12,500
Bank of Cloverdale	20,000
Bank of Corning	15,000
Bank of Davis	12,500
Bank of Galt	12,500
Bank of Gustine	20,000
Bank of Hopland	9,000
Bank of Italy, Hollister	54,000
Bank of Italy, Livermore	29,650
Bank of Italy, Merced	10,000
Bank of Italy, Modesto	150,000
Bank of Italy, San Francisco	285,000
Bank of Italy, Santa Rosa	33,000
Bank of Italy, Stockton	152,500
Bank of Italy, Ventura	8,000
Bank of Lake, Lakeport	25,000
Bank of Lassen, Susanville	24,000
Bank of Lemoore	25,000
Bank of Lincoln	16,000
Bank of Loleta	8,500
Bank of Loomis	11,500
Bank of Los Banos	35,000
Bank of Los Gatos	12,500
Bank of Morgan Hill	17,000
Bank of Newman	30,000
Bank of Orland	25,000
Bank of Pacific Grove	15,000
Bank of Princeton	29,000
Bank of Rio Vista	30,000
Bank of San Jose	80,000
Bank of San Rafael	25.000
Bank of Santa Maria	11,800
Bank of Tehachapi	4,000
Bank of Tomales	27,000
Bank of Western Placer, Lincoln	7,200
Bank of Williams	15,500
Bank of Willits	11,000
Bank of Willows	50,000
Berkeley Bank of Savings & Trust Co.	122,500
Broadway Bank, Oakland	50,000
Butte County National Bank, Chico	97.000
Butte County Savings Bank, Chico	62,000
California National Bank, Sacramento	400,000
California National Bank, Santa Ana	42,000
California Savings Bank, Petaluma	12,500
California Savings Bank, Sacramento	50,000
California Savings & Commercial Bank, Los Angeles	25,000
California State Bank, San Bernardino	12,500
Calistoga National Bank	9,000
Capital National Bank	300,000

Banks Holding State Deposits—Continued.

List of Banks which held State Deposits on June 30, 1918.

Bank	Amount
Carver National Bank, St. Helena	$25,000
Central Bank of Vallejo	29,030
Central National Bank, Oakland	487,000
Central Savings Bank, Oakland	125,000
Citizens Bank of Arlington	12,500
Citizens Bank of Corona	11,100
Citizens Bank of Paso Robles	7,200
Citizens Bank of Winters	20,300
Citizens National Bank of Alameda	24,500
Citizens National Bank of Riverside	22,500
Citizens Savings Bank of Inglewood	12,000
Citizens Savings Bank of Pasadena	25,000
Citizens Savings Bank of San Diego	45,000
Citizens Savings Bank of Upland	5,000
City National Bank of Long Beach	50,000
Claremont National Bank	5,850
Colton National Bank	9,000
Commercial Bank of San Luis Obispo	100,000
Commercial & Savings Bank of Stockton	30,000
Commercial Bank of Ukiah	10,000
Commercial National Bank of Upland	18,000
Consolidated Bank of Elsinore	7,000
Covina National Bank	12,500
Cuyamaca State Bank, El Cajon	6,250
Decker, Jewett & Co. Bank, Marysville	30,000
East San Diego State Bank	5,000
Escondido National Bank	11,700
Exchange National Bank of Long Beach	56,750
Fairoaks Bank	10,000
Farmers Bank of Wheatland	7,300
Farmers Exchange National Bank of San Bernardino	20,000
Farmers & Mechanics Savings Bank of Sacramento	147,000
Farmers & Merchants Bank of Hayward	12,500
Farmers & Merchants Bank of Santa Paula	30,000
Farmers & Merchants Bank of Stockton, Oakdale Branch	9,000
Farmers & Merchants Bank of Stockton	70,000
Farmers & Merchants National Bank, Fullerton	12,500
Farmers & Merchants National Bank, Hanford	20,000
Farmers & Merchants National Bank, Merced	50,000
Farmers & Merchants National Bank, Santa Cruz	40,000
Farmers & Merchants State Bank, Mountain View	20,000
Ferndale Bank	5,000
First Bank of Highland	15,000
First Bank of Jamestown	6,000
First Bank of Livingston	9,000
First Bank of Savings, Fort Bragg	5,000
First National Bank, Alturas	37,500
First National Bank of Anaheim	21,500
First National Bank of Antioch	2,500
First National Bank of Auburn	6,750
First National Bank of Berkeley	150,000
First National Bank of Calexico	19,000
First National Bank of Chico	20,000
First National Bank of Colusa	20,000
First National Bank of Corona	9,500
First National Bank of Cucamonga	5,400
First National Bank of Dixon	11,500
First National Bank of El Centro	19,000
First National Bank of Emeryville	10,000
First National Bank of Escondido	17,000
First National Bank of Eureka	75,000
First National Bank of Exeter	12,500
First National Bank of Fairfield	12,500
First National Bank of Fort Bragg	9,000
First National Bank of Fullerton	25,000

Banks Holding State Deposits—Continued.

List of Banks which held State Deposits on June 30, 1918.

Bank	Amount
First National Bank of Gridley	$14,000
First National Bank of Hayward	12,500
First National Bank of Hemet	12,500
First National Bank of Hollywood	12,500
First National Bank of Holtville	7,500
First National Bank of Imperial	11,500
First National Bank of Lemoore	10,000
First National Bank of Livermore	16,000
First National Bank of Lodi	50,000
First National Bank of Los Banos	12,500
First National Bank of Monrovia	10,000
First National Bank of Monterey	8,750
First National Bank of Lindsay	12,000
First National Bank of Lompoc	19,500
First National Bank of Mountain View	9,900
First National Bank of Newport Beach	12,900
First National Bank of Oakdale	8,000
First National Bank of Ocean Park	10,000
First National Bank of Ontario	16,200
First National Bank of Orange	19,000
First National Bank of Oroville	25,000
First National Bank of Oxnard	15,300
First National Bank of Palo Alto	20,000
First National Bank of Pleasanton	5,400
First National Bank of Reedley	3,400
First National Bank of Rialto	9,000
First National Bank of Richmond	15,000
First National Bank of Riverside	64,500
First National Bank of San Diego	15,000
First National Bank of San Francisco	100,000
First National Bank of San Mateo County, Redwood City	15,000
First National Bank of San Pedro	10,000
First National Bank of Santa Ana	50,000
First National Bank of Santa Barbara	34,000
First National Bank of Santa Cruz	25,000
First National Bank of Santa Maria	12,500
First National Bank of Scotia	12,500
First National Bank of Sebastopol	16,000
First National Bank of Seeley	4,500
First National Bank of Sonoma	5,000
First National Bank of Sonora	50,000
First National Bank of Tustin	14,000
First National Bank of Upland	23,000
First National Bank of Vacaville	25,000
First National Bank of Vallejo	25,500
First National Bank of Ventura	101,500
First National Bank of Weed	10,000
First National Bank of Winters	33,000
First National Bank of Woodland	62,500
First National Bank of Yreka	10,000
First Savings Bank of Emeryville	10,000
First Savings Bank of San Jacinto	9,000
First Savings Bank of Shasta County, Redding	5,000
First State Bank, Manteca	9,500
Fort Bragg Commercial Bank	5,400
Fort Sutter National Bank, Sacramento	49,500
French American Bank of Savings, San Francisco	184,700
Fullerton Savings Bank	25,000
Garden City Bank and Trust Company	136,175
Granite Savings Bank, Monrovia	7,500
Guaranty Trust & Savings Bank, Los Angeles	360,000
Harbor City Savings Bank, San Pedro	12,000
Healdsburg Savings Bank	4,500
Hibernian Savings Bank of Los Angeles	100,000
Holtville Bank, The	3,850

Banks Holding State Deposits—Continued.

List of Banks which held State Deposits on June 30, 1918.

Bank	Amount
Hollywood Savings Bank	$12,500
Home Savings Bank of Escondido	11,000
Home Savings Bank of Woodland	62,500
Home Savings Bank of Woodland, Knights Landing Branch	12,500
International Bank of Calexico	11,500
Italian American Bank of San Francisco	100,000
Jamestown National Bank	6,000
Lindsay National Bank	20,000
Lindsay Savings Bank	12,500
Livermore Valley Savings Bank	19,500
Lodi National Bank	50,000
Los Angeles Trust & Savings Bank	100,000
Marin County National Bank, San Rafael	12,500
Marine Commercial & Savings Bank of Long Beach	20,000
Mayfield Bank	7,000
Mendocino Bank of Commerce	12,300
Merchants National Bank of Los Angeles	300,000
Merchants National Bank of San Francisco	281,000
Merchants National Bank of Santa Monica	25,000
Mierson Banking Company of Placerville	7,500
Mission Bank of San Francisco	50,000
Mission Savings Bank of San Francisco	50,000
Montague Banking Company	27,000
Mutual Savings Bank of San Francisco	125,000
National Bank of D. O. Mills & Company	125,000
National Bank of Orange	15,000
National Bank of Pasadena	28,800
National Bank of Riverside	10,000
Nevada County Bank of Grass Valley	10,000
Northern California National Bank, Redding	10,000
Northern Solano Savings Bank of Dixon	10,750
Novato Bank	10,000
Peoples National Bank of National City	6,000
Peoples Savings Bank of Santa Cruz	10,000
Peoples Savings and Commercial Bank of Chico	32,500
Peoples Trust & Savings Bank of Riverside	8,500
Peoples Savings Bank of Sacramento	250,000
Petaluma National Bank	65,000
Petaluma Savings Bank	25,000
Petaluma Swiss American Bank	75,500
Pioneer Bank, Porterville	23,000
Portuguese American Bank of San Francisco	19,000
Puente Savings Bank	12,500
Redlands National Bank	53,500
Reedley National Bank	4,500
Rideout Smith National Bank, Oroville	32,000
Roseville Banking Company	17,000
Sacramento Bank	348,000
Sacramento Valley Bank & Trust Company	30,000
San Bernardino National Bank	50,000
San Dimas Savings Bank	5,000
San Leandro State Bank	18,800
Santa Barbara Savings & Loan Bank	30,000
Santa Cruz County National Bank of Santa Cruz	25,000
Santa Rosa National Bank	91,000
Savings Bank of Mendocino County, Ukiah	10,000
Savings Bank of Pomona	9,000
Savings Bank of Redlands	25,000
Savings Bank of San Bernardino	12,000
Savings Bank of St. Helena	12,500
Sebastopol National Bank	25,000
Security Bank of Oakland	71,100
Security Commercial & Savings Bank, San Diego	55,500
Security National Bank, Los Angeles	150,000
Security Savings Bank of Riverside	50,000

Banks Holding State Deposits—Continued.

List of Banks which held State Deposits on June 30, 1918.

Bank	Amount
Security State Bank, San Jose	$50,000
Security Trust & Savings Bank of Los Angeles	500,000
Siskiyou County Bank, Yreka	25,000
Sonoma County National Bank, Petaluma	85,000
Southern Trust & Commerce Bank of San Diego	139,000
State Bank of San Pedro	9,000
Tehama County Savings Bank	12,500
Tuolumne County Bank	25,000
Union National Bank of San Luis Obispo	20,350
Union Savings Bank of Redlands	10,000
Union Trust Company of San Francisco	117,000
Vacaville Savings Bank	12,500
Vallejo Commercial Bank	15,000
West Berkeley Bank	11,000
West Side Bank of Tracy	20,000
Wells Fargo Nevada National Bank	500,000
Willits Commercial Bank	12,500
	$13,893,725
Total interest collected on deposits, sixty-ninth fiscal year	$318,310 46

SPANISH-AMERICAN WAR ACCOUNT.

Transactions in payment of members of the National Guard of California for services rendered in the Spanish-American War of 1898, before their enlistment as United States volunteers, during the sixty-eighth and sixty-ninth fiscal years. This is a special account and not part of the state funds.

Series No. 1.

Cash on hand June 30, 1916	$2,328 00	
Balance		$2,328 00

Series No. 2.

Cash on hand June 30, 1918	$3,630 50	
Balance		3,630 50
Total balance June 30, 1918		$5,958 50

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ANNUAL REPORT

on the

Building and Loan Associations

of the

State of California

by the

BUILDING AND LOAN COMMISSIONER

In accordance with an Act of the Legislature, approved April 5, 1911

to

His Excellency WILLIAM D. STEPHENS, Governor of the State of California

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August 13, 1917

CALIFORNIA STATE PRINTING OFFICE
SACRAMENTO
1917

33144

REPORT

OF THE

BUREAU OF BUILDING AND LOAN SUPERVISION.

Office of the Building and Loan Commissioner,
San Francisco, August 13, 1917.

To His Excellency, William D. Stephens, *Governor of California.*

Sir: Pursuant to the provisions of section 5 of the Building and Loan Commission Act, I have the honor to submit this the Twenty-fourth Annual Report of this department, relative to the operations of the building and loan associations of California for the sixty-eighth fiscal year, ended June 30, 1917.

During the fiscal year just closed one new association was formed and licensed, but, after an unsuccessful attempt to establish itself, it retired, together with four others, thus leaving 86 California associations now on the active roll, the annual reports of which enter into the tabulations and calculations set forth herein and in the appendix thereafter following.

Aside from these 86 associations, one formed in another state has complied with the requirements of the laws of this state and is duly licensed to transact business in all respects the same as our own corporations.

The annual reports of the 86 California associations, as made at the close of their several fiscal years, show aggregate assets amounting to $35,928,446.84—a net gain during the year of $3,134,428.66—equal to 9.55 per cent of the reported assets at date of last report.

By reference to the schedule of "Changes in Assets and Liabilities," it will be noted that every feature of the assets—with the sole exception of Arrearages—show an increase in volume; that of loans amounting to $2,405,654.13, or practically 8 per cent. The money on hand and in bank is 26 per cent in excess of that of last report, and the real estate shows an increase of over 38 per cent.

A like condition appears in the classified liabilities—the principal increases being in the Guarantee Stock, Installment Stock, Full-paid Stock, Investment Certificates and Incomplete Loans—this latter item largely absorbing the increase in money on hand.

By reference to the schedule "Distribution of Assets by Counties," it will be noted that 18 counties show increases in varying amounts from about two thousand to upwards of two millions each, while 9 counties show decreases aggregating in all only $141,246.62, about one-third of which results from the enforced closing by this office of the association at Benicia.

The number of members holding installment and full-paid shares appear to have increased 2,220 while the holders of investment certificates, as reported, appear to have decreased 2,243, but the average investment of all appears to be $733.78, or $32.63 in excess of last year.

The number of borrowers are reported as 20,299 with an average loan to each of $1,608.40.

The outstanding shares of all classes show a gain of 9,969, and the investment certificates a gain of 15,242.

The number of new loans made are reported as 6,691, a gain of 449 over the last report; of this number 1,822 are reported as building loans, for the construction of new buildings, mostly residences; thus increasing the total of such loans reported since 1893 to the respectable number of 48,022.

Fifty-eight associations—eight more than last year—now hold 263 pieces of real estate—six of which—one each in Oakland, San Jose, Santa Ana and Ontario, and two in Pomona—have invested a part or all their surplus reserves in office buildings for their own use, and for rental of all space not actually needed for themselves.

The reserve and undivided profits now aggregate $1,386,700.66, or 4.42 per cent of the average loans in force.

The law requires that 5 per cent of the net profits be added to the reserve each year until it shall equal 5 per cent of the loans in force; but wherever an association has a guarantee capital, or where a mutual association has a reserve and undivided profits in excess of 5 per cent of the loans in force, no addition whatever should be made to the reserves, but all the net profits should be apportioned to the installment and other full participating shares.

The 86 associations reporting make loans at 16 different rates varying from 6½ to 12 per cent per annum, the mean average rate of which is 8.40 per cent, while the reported interest collections are 8.55 per cent of the average loans in force, indicating that the larger volume of loans are at a rate in excess of the mean average of all rates.

STATUS OF ASSOCIATIONS.

Active roll June 30, 1916	90
New associations licensed—	
State Building and Loan Corporation, San Francisco	1
	91
Retired—	
State Rural Credit Association, San Francisco.	
Mutual Building and Loan Association, Pasadena.	
Altos Building and Loan Association, Los Altos.	
State Building and Loan Corporation, San Francisco.	
Benicia Building and Loan Association, Benicia.	
	5
Active roll June 30, 1917	86
In liquidation—	
Fairmount Loan Association, San Francisco.	
Mission Home and Loan Association, San Francisco.	
Continental Building and Loan Association, San Francisco.	
State of California Building and Loan Association, San Diego.	
Benicia Building and Loan Association, Benicia.	
	5
Total	91

REASONS FOR RETIREMENT.

The State Rural Credit Association, originally formed for the purpose of making farm loans, retired upon the passage of the Federal Farm Loan Act and transferred its assets to the State Building and Loan Corporation.

The Mutual Building and Loan Association of Pasadena transferred its assets and liabilities to the California Security Loan Corporation and retired.

The Altos Building and Loan Association of Los Altos sold its assets to the San Jose Building and Loan Association of San Jose, paid off its liabilities and disincorporated.

The State Building and Loan Corporation sold its assets to the Security Savings and Loan Association of Reno, Nevada, and retired from business in this state.

The Benicia Building and Loan Association of Benicia was closed by the Commissioner on January 20th for irregularities and, upon his action being approved by the Superior Court, H. B. Staley was appointed Special Deputy Commissioner in charge and the business is now in process of liquidation by him as provided by law. Two dividends, amounting to 45 per cent of the allowed claims, having already been paid.

CHANGES IN ASSETS SINCE 1905.

The changes in assets, as well as in the total roll and number reporting since 1905, are as follows:

Years	Total roll	Number reporting	Assets	Increase
1906	131	106	$19,228,938 88	------------
1907	125	107	19,522,896 86	$293,957 98
1908	120	107	19,635,657 94	112,761 08
1909	120	105	20,228,116 40	592,458 46
1910	113	107	21,255,176 49	1,027,060 09
1911	105	96	23,340,012 38	2,084,835 89
1912	107	91	24,866,571 97	1,526,559 59
1913	98	93	28,316,021 97	3,449,450 00
1914	97	92	29,515,762 57	1,199,740 60
1915	97	89	30,441,084 03	925,321 46
1916	96	89	32,794,018 18	2,352,934 15
1917	91	86	35,928,446 84	3,134,428 66

Foreign associations (not included in tabulations):
Western Loan and Building Company, Salt Lake City, Utah, (See last page of appendix.) California business aggregates $109,216.80 net.

ASSETS AND LIABILITIES.

Assets.

Loans on mortgages and stock	$32,648,975 39
Arrearages	179,638 11
Cash in office and bank	1,756,015 87
Real estate owned	1,128,463 54
Furniture and fixtures	27,823 04
Advances—personal accounts	180,766 32
Other assets	6,764 57
	$35,928,446 84

Liabilities.

Guarantee stock—capital	$951,275 55
Guarantee stock—surplus	174,762 93
Installment shares—dues	10,900,106 09
Installment shares—profits	3,239,199 03
Paid-up and prepaid shares—capital	5,768,811 96
Paid-up and prepaid shares—dividends	300,565 46
Investment certificates—principal	10,940,370 41
Investment certificates—dividends	320,133 47
Advance payments	30,001 72
Overdrafts and bills payable	832,633 47
Reserve and undivided profits	1,386,700 66
Loans due and incomplete	905,064 80
Sundry ledger accounts	140,370 77
All other liabilities	38,450 52
	$35,928,446 84

RECEIPTS AND DISBURSEMENTS.

Receipts.

Balance from last report	$1,332,466 58
Guarantee stock	178,311 05
Installment shares—dues	3,278,139 70
Paid-up and prepaid shares—dues	1,926,470 12
Investment certificates	3,733,012 08
Interest	2,684,003 09
Premiums	55,040 40
Fines	31,907 05
Fees	13,207 03
Loans repaid	10,873,426 40
Overdrafts and bills payable	877,710 82
Advances repaid—personal accounts	441,640 25
All other receipts	1,071,796 94
	$26,497,131 51

Disbursements.

Overdrafts and bills payable	$1,023,711 57
Loans on mortgages and shares	13,626,938 92
Interest paid	80,795 90
Dividends on guarantee stock	103,341 32
Dues repaid—installment shares	2,776,983 49
Profits repaid—installment shares	959,000 82
Paid-up and prepaid shares—capital	776,162 88
Paid-up and prepaid shares—dividends	336,482 78
Investment certificates—principal	2,317,627 81
Investment certificates—dividends	590,804 35
Advances—personal accounts	188,684 23
Salaries	217,470 13
Taxes	57,418 28
Other expenses	175,811 40
All other disbursements	1,509,881 76
Balance—cash in office and bank	1,756,015 87
	$26,497,131 51

CHANGES IN ASSETS AND LIABILITIES.

Assets.

	Increase	Decrease
Loans on mortgages and stock	$2,405,654 13	
Arrearages		$8,985 59
Cash in office and bank	370,361 69	
Real estate owned	315,683 78	
Furniture and fixtures	298 12	
Advances—ledger accounts	50,454 49	
Other assets	962 04	
Net increase	$3,134,428 66	

Liabilities.

	Increase	Decrease
Guarantee stock—capital	$135,835 83	
Guarantee stock—surplus	35,756 07	
Installment shares—dues	397,507 64	
Installment shares—profits	56,570 23	
Paid-up and prepaid shares—capital	1,150,622 73	
Paid-up and prepaid shares—dividends		$36,922 41
Investment certificates—principal	1,160,431 61	
Investment certificates—dividends	81,097 35	
Advance payments		26,648 94
Overdrafts and bills payable		136,389 10
Reserve and undivided profits	6,156 54	
Loans due and incomplete	303,847 42	
Sundry ledger accounts	28,955 07	
All other liabilities		4,391 88
Net increase	$3,134,428 66	

DISTRIBUTION OF ASSETS BY COUNTIES.

Counties	Associations	Number reporting	Assets	Increase	Decrease
Alameda	7	7	$1,229,144 63	$44,393 74	
Fresno	1	1	170,576 08		$12,672 32
Humboldt	1	1	29,991 88		1,428 49
Kern	2	2	556,641 42	50,639 02	
Los Angeles	11	11	16,280,269 04	2,117,116 29	
Madera	1	1	32,674 67	7,534 96	
Marin	3	3	268,467 11		7,853 87
Merced	1	1	145,677 89	3,873 25	
Napa	1	1	261,010 46	31,858 01	
Orange	3	3	1,281,227 77	77,327 60	
Placer	1	1	54,581 55	1,812 56	
Riverside	2	2	183,508 22		2,908 36
Sacramento	1	1	410,049 26	7,762 97	
San Bernardino	4	4	2,555,713 84	101,654 52	
San Diego	3	3	564,622 58		42,526 05
San Francisco	20	20	4,345,621 18	262,908 07	
San Luis Obispo	2	2	201,772 49	16,855 39	
San Joaquin	3	3	1,964,501 27	160,595 06	
San Mateo	2	2	495,287 26		21,283 86
Santa Barbara	2	2	1,124,442 00	135,767 41	
Santa Clara	6	6	2,486,395 75	198,640 40	
Santa Cruz	1	1	38,277 86		2,897 35
Solano	1	1	9,371 48		46,749 32
Sonoma	2	2	195,376 43	2,152 11	
Tulare	3	3	502,309 57	27,169 25	
Ventura	1	1	511,128 41	27,614 67	
Yolo	1	1	29,806 74		2,927 00
	86	86	$35,928,446 84	$3,275,675 28	$141,246 62

STATISTICAL INFORMATION.

Number of members:	Male	19,190	
	Female	11,330	
			30,520
Number of investors:	Male	7,050	
	Female	4,657	
			11,707
Total members and investors			42,227
Average investment, including accumulated earnings			$733.78
Number of borrowers			20,299
Average amount of each loan			$1,608.40
Number of new mortgage loans for year		5,816	
Number of new share loans for year		875	
			6,691
Number of building loans for year			1,822
Total number of building loans to date			48,022
Percentage of new loans to loans in force			39.10 %
Percentage of loans repaid			28.21 %
Mean average of interest rates in force			8.40 %
Average of interest collections reported			8.55 %
Apparent gross income to average loans in force			8.665%
Shares in force last report			360,108
Shares issued since last report			80,476
Shares cancelled since last report			70,507
Shares in force this report			370,077
Investment certificates in force last report			94,331
Investment certificates issued since last report			33,965
Investment certificates cancelled since last report			18,123
Investment certificates in force this report			110,173
Number of associations owning real estate			58
Number of pieces of real estate owned			263
Number of associations owning own office buildings			6
Book value of all real estate owned			$1,128,463.54
Reserve and undivided profits			1,386,700.66
Guarantee capital and surplus			1,126,038.48
Aggregate surplus for protection of members and investors			2,512,739.14

Net Profits.

Net profits reported for year	$2,306,895.44	
Percentage to average loans in force		7.353%
Average for past 11 years		6.946%
Percentage to average investment		7.445%
Average for past 11 years		7.450%
The dividend rate to installment shares ranges from 4 to 12 per cent per annum—only six associations paying less than 6 per cent—with a mean average rate of		7.150%
The amount of dividend apportioned to installment shares was	$1,038,185.13	
To full paid shares	349,527.75	
To investment certificates	616,090.12	

SALARIES, TAXES AND OTHER EXPENSES.

	Amount	Percentage to loans in force
Salaries	$217,470 13	0.623
Taxes	57,118 28	0.167
Other expenses	175,811 40	0.512
Totals	$450,399 81	1.302
Percentage at last report		1.473

OPERATING EXPENSES TO LOANS.

The element of taxes, while an expense that is a necessity and must be met, is not within the control of the management, hence must be eliminated in order to determine the real operating expenses, which then appear as follows:

For salaries	0.633%
For other expenses	0.512%
Total	1.145%

upon the average loans in force for the year, as against 1.268 per cent for the year ending June 30, 1916.

OPERATING EXPENSES TO DUES CAPITAL.

Based on the average of dues capital paid in on all classes of shares and certificates, the salaries and other operating expenses show the following percentages:

For salaries	0.784%
For other expenses	0.634%
Total	1.418%

This percentage in last report was 1.508%.

GROSS INCOME AND PERCENTAGE OF ALL EXPENSES TO INCOME.

The percentage of the gross income of all the associations to the average volume of "Loans in Force" can be very closely approximated as follows:

	1917	1916
Net profits reported as above	7.353%	7.392%
Taxes paid	0.167%	0.205%
Operating expenses	1.145%	1.268%
Apparent gross income	8.665%	8.865%
Ratio of operating expenses to gross income	13.214%	14.387%

GROSS INCOME AND PERCENTAGE OF EXPENSES TO DUE CAPITAL.

Based upon the "dues capital" in force for the year, exclusive of profits or dividends credited or paid, the apparent percentages are as follows:

	1917	1916
Net profits reported	8.354%	8.765%
Taxes paid	0.207%	0.243%
Operating expenses	1.418%	1.508%
Apparent gross income	9.979%	10.516%
Ratio of operating expenses	14.209%	14.340%

ASSOCIATIONS HAVING A PAID-IN GUARANTEE CAPITAL.

Associations	Location	Assets	Capital and surplus	Dividend apportioned to guarantee capital	Rate of dividend to installment shares
Central	Alameda	$257,861	$22,697	$1,244	6 %
Berkeley	Berkeley	29,305	17,307		6 %
Corona Mutual	Corona	41,552	5,400	795	8 %
Bankers	Los Angeles	31,371	16,030		6 %
Fidelity	Los Angeles	7,415,584	133,297	6,351	12 %
State Mutual	Los Angeles	4,297,147	293,871	30,848	9 %
Southern California	Los Angeles	932,501	52,510	6,000	7 %
Mutual	Long Beach	342,466	27,500	1,125	8 %
Orange	Orange	607,838	34,000	3,500	8½ %
Palo Alto Mutual	Palo Alto	522,784	31,870	2,816	7 %
California Security	Pasadena	1,003,577	100,000	20,500	6 %
Pasadena	Pasadena	202,330	9,785	1,495	6 %
Home Builders	Pomona	661,155	112,000	11,000	10 %
Home Investment	Redlands	614,179	120,000	12,000	8 %
California Home	San Francisco	700,802	44,958	3,375	7.8%
Home Mutual	San Francisco	256,989	25,683	3,887	6 %
Santa Cruz County	Santa Cruz	38,277	23,305	651	7 %
Security	Stockton	193,074	26,945	2,279	6 %
Vallejo	Vallejo	9,371	4,106		6 %
Northern California	Woodland	29,806	14,892	176	6 %
20 associations		$17,187,969	$1,116,156		av. 7.3%

ASSOCIATIONS IN LIQUIDATION.

At the date of the last report there were six associations in process of liquidation. The affairs of two of these have been closed and their names dropped from the rolls of the office, while four still remain unfinished.

The final report required by law, in the matter of the "Orange County Mutual" of Santa Ana, was filed with and approved by the Superior Court, and a copy of the order of approval filed in this office on November 3, 1916.

The trustees having in charge the liquidation of the "Pacific Coast Savings Society" of San Francisco, report that the affairs are virtually closed, as all assets have been disposed of and a final dividend paid.

In the matter of the "Continental," in bankruptcy, P. J. Fay was elected as "trustee" and is proceeding with the liquidation as speedily as conditions will permit. In this connection it may be of interest to note that the final ruling of the Referee in Bankruptcy is to the effect that the loans of the "Continental" are *definite contract loans* and are to be settled as such, and that their so-called D. C. stock is not stock that has any value or liability as such—thereby sustaining the original claim of this office regarding both.

The "Fairmount" and "Mission Home" of San Francisco—both in "voluntary" liquidation—have been unable to dispose of the few pieces of real estate owned, at satisfactory prices, thus delaying final liquidation, but the prospects are favorable for an early disposition and final closing.

The affairs of the "State of California Mutual" of San Diego are practically in the same condition as at date of last report. The assets consist of real estate—some 140 lots—located in an outlying portion of the city, and not easily disposed of at satisfactory prices.

CHANGES IN THE LAWS.

During the late session of the legislature several changes were made in the laws affecting building and loan associations.

Section 638 of the Civil Code was so amended as to require the exact rate of interest to be set forth in every note taken for a loan made by an association, to the end that the borrower shall always know the rate of interest he is paying for money he borrows from an association.

Sections 2 and 3 of the Commissioner Act were so amended as to provide for an additional deputy in the office of the Commissioner, at a salary of $1,800 per annum.

Section 17 of the same act was so amended as to provide for a "revolving" fund for the use of the office of the Commissioner, in an amount not to exceed $300.

A new section, No. 15*a*, of the Commissioner Act was created to provide for the annual licensing of agents soliciting for loans from and for the sale of shares of stock, shares of membership and certificates of investment of associations. The intention of this law was not for the purposes of revenue, but rather for the protection of associations against the future employment of agents, either traveling or local, who may have been dismissed for cause, or who may have left the employ of an association without a "clean bill of health." As finally passed, it was amended so as to eliminate local agents, thereby nullifying the original intent and removing all protection against a class that, in the past, have not uniformly received a clean bill of health from their employers.

Chapter 215 of the laws of 1917, now known as the "Corporation License Act," is of special interest to associations, as under its provisions they are relieved of the burden of paying an annual tax upon an authorized capitalization that never is and never can be paid up in full in the same manner as in other classes of corporations.

The amended section 2924 of the Civil Code is also of interest to associations, as under its provisions they must record a notice of intention to sell trust or mortgage property, held as security for loans hereafter made, for not less than three months prior to date of sale to satisfy an obligation.

LIBERTY BONDS.

At the meeting of the State League of Building and Loan Associations in Los Angeles, in May last, it developed that there was a very general accumulation of money in excess of acceptable applications for loans, and it was suggested that if the associations were worried because of such undue accumulation in excess of available and satisfactory loans, that it would be a wise and patriotic move for them to invest a part or all their uninvested reserves in the 3½ per cent Liberty Bonds, thereby aiding the government and at the same time securing some return on their unemployed surplus funds. Later a circular letter was mailed to all the secretaries granting permission to make such investment, and requesting that subscriptions made be reported to this office as required by law. Thus far 21 associations have reported subscriptions amounting to $108,100. In view of the fact that the rate of interest paid by the bonds is less than one-half the average loaning rate of the associations, and less than the savings bank rate of dividends, they are to be commended for their patriotic spirit and financial sacrifice in aid of the government.

CONCLUSION.

The appendix to this report, when published, will contain the usual condensed reports of the several associations as made to this office at the close of their fiscal years, showing the book and withdrawal values at annual periods, of the shares of serial associations, and the dues, dividend rate, book and withdrawal values of the permanent or "Dayton" plan associations, all arranged alphabetically both as to location and name of association, closing with the last report of foreign associations. It will also contain a detailed statement of the receipts of this department, as required by law, and the names and addresses of the several secretaries, arranged alphabetically by cities and towns.

Respectfully submitted.

GEO. S. WALKER,
Commissioner.

Attest:
J. L. Fields, *Secretary.*

STATEMENT OF RECEIPTS ON ACCOUNT OF LICENSES AND ASSESSMENTS FOR EXPENSES.

Fiscal Year Ending June 30, 1917.

Associations	Location	Amount
Central Loan Association	Alameda	$60 77
Columbia Mutual Building and Loan Association	Alameda	44 52
Savings Loan and Building Association	Anaheim	33 77
Kern County Mutual Building and Loan Assn.	Bakersfield	97 68
People's Mutual Building and Loan Association	Bakersfield	48 46
Berkeley Home Investment Association	Berkeley	10 10
Corona Mutual Building and Loan Association	Corona	12 05
Escondido Mutual Building and Loan Association	Escondido	10 00
Fortuna Building and Loan Association	Fortuna	10 00
Mutual Building and Loan Association	Fresno	49 94
Livermore Mutual Building and Loan Association	Livermore	10 09
Mutual Building and Loan Association	Long Beach	59 28
Home Investment Building and Loan Association	Los Angeles	13 85
Metropolitan Loan Association	Los Angeles	70 41
Southern California Loan Association	Los Angeles	236 03
Fidelity Savings and Loan Association	Los Angeles	1,810 15
State Mutual Building and Loan Association	Los Angeles	1,177 35
Bankers Guaranty-Loan Company	Los Angeles	10 00
Los Gatos Building and Loan Association	Los Gatos	10 00
Madera Mutual Building and Loan Association	Madera	10 00
Merced Mutual Building and Loan Association	Merced	40 95
Tamalpais Mutual Building and Loan Association	Mill Valley	15 69
Napa Building and Loan Association	Napa	66 35
Newcastle Building and Loan Association	Newcastle	15 24
Alameda County Loan Association	Oakland	153 54
Cosmopolitan Mutual Building and Loan Assn.	Oakland	46 70
People's Mutual Building and Loan Association	Ontario	151 25
Orange Building and Loan Association	Orange	175 42
Palo Alto Mutual Building and Loan Association	Palo Alto	149 48
Pasadena Building and Loan Association	Pasadena	40 52
California Security Loan Corporation	Pasadena	233 71
Paso Robles Mutual Building and Loan Assn.	Paso Robles	11 08
Petaluma Mutual Loan Association	Petaluma	14 95
Pleasanton Mutual Building and Loan Assn.	Pleasanton	10 00
Mutual Building and Loan Association	Pomona	235 78
Home Builders Loan Association	Pomona	135 44
Porterville Mutual Building and Loan Assn.	Porterville	26 58
San Mateo County Building and Loan Association	Redwood City	113 67
Home Investment Association	Redlands	167 10
Riverside County Mutual Building and Loan Assn.	Riverside	43 59
Sacramento Building and Loan Association	Sacramento	116 66
Santa Fe Building and Loan Association	San Bernardino	315 21
San Diego Building and Loan Association	San Diego	87 49
Silver Gate Building and Loan Association	San Diego	80 16
Argonaut Mutual Building and Loan Association	San Francisco	14 88
Bay City Building and Loan Association	San Francisco	20 09
Bay View Building and Loan Association	San Francisco	10 00
California Home-Building-Loan Corporation	San Francisco	184 98
California Mutual Savings Fund Loan and Building Association	San Francisco	17 42
Citizens Building and Loan Association	San Francisco	151 31
Empire Building and Loan Association	San Francisco	18 00
Eureka Building and Loan Association	San Francisco	12 62
Fidelity Building and Loan Association	San Francisco	48 33
Franklin Mutual Building and Loan Association	San Francisco	62 32
Globe Mutual Building and Loan Association	San Francisco	35 46
Home Mutual Deposit Loan Company	San Francisco	69 09
Mechanics Building and Loan Association	San Francisco	24 04
Occidental Loan Association	San Francisco	22 49
Pacific Loan Association	San Francisco	10 58
Pacific States Savings and Loan Company	San Francisco	348 99
Provident Mutual Loan Association	San Francisco	51 52
Progress Mutual Loan Association	San Francisco	18 86

STATEMENT OF RECEIPTS, ETC.—Continued.

Associations	Location	Amount
State Building and Loan Corporation	San Francisco	10 00
Union Loan Association	San Francisco	10 98
Western Loan Association	San Francisco	21 69
Mutual Building and Loan Association of San Jose and College Park	San Jose	229 86
Nucleus Building and Loan Association	San Jose	72 11
San Jose Building and Loan Association	San Jose	116 92
San Luis Building and Loan Association	San Luis Obispo	42 67
San Mateo Mutual Building and Loan Association	San Mateo	34 97
Marin County Mutual Building and Loan Assn.	San Rafael	47 75
Home Mutual Building and Loan Association	Santa Ana	167 41
Loan and Building Association	Santa Barbara	105 84
Santa Barbara Mutual Building and Loan Assn.	Santa Barbara	176 19
Santa Clara Building and Loan Association	Santa Clara	72 25
Santa Cruz County Building and Loan Assn.	Santa Cruz	11 94
Santa Paula Building and Loan Association	Santa Paula	139 76
Santa Rosa Building and Loan Association	Santa Rosa	40 37
Sausalito Mutual Loan Association	Sausalito	14 40
San Joaquin Valley Building and Loan Assn.	Stockton	219 23
Security Building and Loan Association	Stockton	32 14
Stockton Land, Loan and Building Association	Stockton	266 24
Tulare Building and Loan Association	Tulare	13 46
Magnolia Mutual Building and Loan Association	Upland	75 10
Vallejo Building and Loan Association	Vallejo	10 00
Visalia Building and Loan Association	Visalia	99 06
Northern California Building and Loan Assn.	Woodland	10 00
Western Loan and Building Company	Salt Lake City	48 53
		$9,440 86
One new license issued during the year		2 00
		$9,442 86

Deposited with State Treasurer:

January 30, 1917, Controller's Receipt No. 2005	$7,500 00
March 7, 1917, Controller's Receipt No. 2326	1,642 86
Balance to Revolving Fund	300 00
	$9,442 86

STATE OF CALIFORNIA,
City and County of San Francisco, } ss.

J. L. Fields, Secretary for the Building and Loan Commissioner, being first duly sworn, deposes and says the foregoing is a correct statement of the receipts for the fiscal year ended June 30, 1917, and of the disposition of same.

J. L. FIELDS.

Subscribed and sworn to before me this thirteenth day of August, 1917.

GEO. S. WALKER,
Commissioner.

SECRETARIES AND THEIR LOCAL ADDRESSES.

Location	Name	Associations	Address
Alameda	H. Rosenthal	1	2301 Central avenue.
Anaheim	Fred A. Backs, Jr.	1	Anaheim.
Bakersfield	E. W. Spiers	1	Care Producers Savings Bank.
Bakersfield	Arthur S. Crites	1	Care First Bank of Kern.
Berkeley	F. H. Clark	1	2011 Shattuck avenue.
Corona	John P. Key	1	First National Bank Building.
Escondido	F. G. Baldridge	1	Care Escondido Savings Bank.
Fortuna	C. A. Friedenbach	1	Fortuna.
Fresno	Wick W. Parsons	1	Care People's Savings Bank.
Los Angeles	W. A. Bonynge	1	Care Commercial National Bank.
Los Angeles	Julius H. Martin	1	431 W. Fifth street.
Los Angeles	Isaac Norton	1	604 Title Insurance Building.
Los Angeles	C. J. Wade	1	722 S. Spring street.
Los Angeles	G. H. Wadleigh	2	601 S. Hill street.
Los Gatos	E. G. Angell	1	Los Gatos.
Long Beach	W. S. Stevens	1	Broadway and Locust street.
Livermore	C. F. Wente	1	Care First National Bank.
Madera	E. M. McCardle	1	Care Madera Abstract Co.
Merced	J. H. Simonson	1	Merced.
Mill Valley	Paul Helmore	1	P. O. box 575.
Napa	John N. Mount	1	Napa.
Newcastle	John Wallace	1	Newcastle.
Oakland	W. S. Gould	1	1248 E. Twelfth street.
Oakland	C. P. Hoag	1	563 Sixteenth street.
Oakland	R. R. Read	1	88 Blake and Moffatt Building.
Ontario	J. O. Henderson	1	Ontario.
Orange	U. D. Rhodes	1	Orange.
Palo Alto	Edward Jesurun	1	259 University avenue.
Pasadena	E. D. Hill	1	18 N. Marengo avenue.
Pasadena	F. E. Warriner	1	170 E. Colorado avenue.
Paso Robles	F. G. Wetzel	1	Care First National Bank.
Petaluma	F. A. Cromwell	1	Petaluma.
Pleasanton	T. H. Silver	1	Care Bank of Pleasanton.
Pomona	W. D. Frederick	1	260 S. Thomas street.
Pomona	C. E. Greaser	1	261 S. Thomas street.
Porterville	C. O. Premo	1	Porterville.
Redlands	J. Warren Smith	1	Fifth and Citrus streets.
Redwood City	H. W. Schaberg	1	Redwood City.
Riverside	M. S. Bowman	1	630 Seventh street.
Sacramento	Frank Hickman	1	724 J street.
San Bernardino	John Flagg	1	367 E street.
San Diego	J. R. Beardsley	1	940 Third street.
San Diego	H. A. Croghan	1	411 E street.
San Francisco	D. A. Steinbaugh	1	1208 Railroad avenue.
San Francisco	Wm. E. Bouton	5	255 Montgomery street.
San Francisco	B. Fedde	1	995 Market street.
San Francisco	B. M. Gunzburger	3	1933 Ellis street.
San Francisco	R. L. Handy	1	206-207-208 Hearst Building.
San Francisco	A. R. Knoll	2	282 Bush street.
San Francisco	W. S. Pardy	1	550 California street.
San Francisco	N. Steinberger	2	715 Clunie Building.
San Francisco	B. M. Stich	3	1933 Ellis street.
San Francisco	Fremont Wood	1	405 Pine street.
San Jose	C. H. Johnson	1	12 N. First street.
San Jose	Ralph E. Sanders	1	34 E. San Antonio street.
San Jose	W. M. Sontheimer	1	81 W. Santa Clara street.
San Luis Obispo	M. Lewin	1	Chorro and Monterey streets.
San Mateo	C. H. Kirkbride	1	San Mateo.
San Rafael	L. A. Lancel	1	San Rafael.
Santa Ana	O. M. Robbins	1	Santa Ana.
Santa Barbara	Laura M. Baker, pro tem.	1	P. O. Box 35.
Santa Barbara	J. M. Warren	1	Care Santa Barbara County National Bank.

SECRETARIES AND THEIR LOCAL ADDRESSES—Continued.

Location	Name	Asso-ciations	Address
Santa Clara	F. O. Roll	1	Santa Clara.
Santa Cruz	Geo. W. Wood	1	21 Pacific avenue.
Santa Paula	H. H. Youngken	1	Santa Paula.
Santa Rosa	C. D. Barnett	1	Santa Rosa.
Sausalito	John J. Ross	1	Sausalito.
Stockton	C. E. Littlehale	1	223 E. Weber street.
Stockton	A. M. Noble	1	15 S. Hunter street.
Stockton	F. L. Williams	1	26 N. San Joaquin street.
Tulare	J. L. Wilder	1	Tulare.
Upland	M. F. Palmer	1	Upland.
Vallejo	J. R. Wilson	1	318 Georgia street.
Visalia	C. L. Johnson	1	Care Visalia Abstract Company.
Woodland	James L. Hare	1	Beamer Block.
Salt Lake City	John T. White	1	49 E. First South street.

APPENDIX

Detailed Statement of the Condition

of the

Building and Loan Associations

of the

State of California

As compiled from the reports to the Commissioner for the
fiscal year ending June 30, 1917

Arranged Alphabetically by Cities and Towns

BUILDING AND LOAN ASSOCIATIONS.

No. 1. ALAMEDA.

CENTRAL LOAN ASSOCIATION.

(Incorporated July 29, 1909.)

H. Rosenthal, Secretary. F. N. Delanoy, President.

Fiscal year ended June 30, 1917.

No. of series, none. No. of members and investors, 249. No. of shares, 6,729.

Assets.	
Loans, on mortgages	$246,607 52
Arrearages, on interest	2,119 28
Cash in bank	2,057 42
Real estate owned	5,819 97
Furniture and fixtures	1,148 80
Advances, ledger accounts	43 65
Other assets	65 12
Total assets	$257,861 76

Liabilities.	
Guarantee stock, capital	$15,554 00
Guarantee stock, surplus	7,143 39
Installment shares, dues	150,245 22
Installment shares, profits	21,851 47
Investment certificates, principal	43,050 00
Investment certificates, dividends	291 70
Overdrafts and bills payable	10,000 00
Loans due and incomplete	8,854 35
Sundry ledger accounts, contingent	871 63
Total liabilities	$257,861 76

Receipts for Fiscal Year.	
Balance from last report	$19,689 62
Installment shares, dues	75,064 11
Investment certificates	7,600 00
Interest	15,530 90
Loans repaid	58,218 09
Overdrafts and bills payable	43,000 00
Advances reaid, personal accounts	2,894 20
Total receipts	$221,996 92

Disbursements for Fiscal Year.	
Overdrafts and bills payable	$33,000 00
Loans on mortgages and shares	108,483 30
Interest paid	265 32
Dividends on guarantee stock	4,066 60
Dues repaid, installment shares	45,688 76
Profits repaid, installment shares	2,665 80
Investment certificates, principal	10,000 00
Investment certificates, dividends	4,515 56
Advances, personal accounts	2,918 45
Salaries	1,032 00
Taxes	238 24
Other expenses	776 70
All other disbursements, real estate, etc.	6,288 77
Balance, cash in office and bank	2,057 42
Total disbursements	$221,996 92

Installment Shares, With Age, Value, and Withdrawal Value.

Dayton plan.
Dues 50 cents per share per month.
Dividend, last fiscal year, 6 per cent.
Book value, dues plus dividend.
Withdrawal value, full book value.

No. 2. ALAMEDA.

COLUMBIA MUTUAL BUILDING AND LOAN ASSOCIATION.

(Incorporated July 18, 1893.)

R. R. Read, Secretary. James K. Lynch, President.

Fiscal year ended July 31, 1916.

No. of series, 23. No. of members and investors, 235. No. of shares, 3,046.

Assets.		
Loans, on definite contract, $135,137.43; on shares, $4,629.27; on contract sales, $2,931.74		$142,698 44
Arrearages—		
On shares	$925 90	
On interest	378 44	
		1,304 34
Cash in bank		12,804 91
Advances, ledger accounts		1,341 99
Total assets		$158,149 68

Liabilities.	
Installment shares, dues	$106,170 00
Installment shares, profits	21,189 66
Advance payments	5,414 24
Overdrafts and bills payable	18,267 11
Reserve and undivided profits	3,309 14
Loans due and incomplete	3,704 03
All other liabilities, suspense	95 50
Total liabilities	$158,149 68

Receipts for Fiscal Year.	
Balance from last report	$3,575 81
Installment shares, dues	37,480 05
Interest	11,331 59
Fines	83 05
Fees	52 00
Loans repaid	44,340 55
Overdrafts and bills payable	32,224 76
Advances repaid, personal accounts	894 02
All other receipts	17 50
Total	$129,999 33

Disbursements for Fiscal Year.	
Overdrafts and bills payable	$24,323 21
Loans on mortgages and shares	61,873 28
Interest paid	1,423 97
Dues repaid, installment shares	20,952 00
Profits repaid, installment shares	5,042 22
Advances, personal accounts	1,270 83
Salaries	1,895 00
Taxes	60 00
Other expenses	353 91
Balance, cash in office and bank	12,804 91
Total disbursements	$129,999 33

Installment Shares, With Age, Value, and Withdrawal Value.

Serial No.	Age in months	Total dues per share	Book value per share	Withdrawal value
35	120	$120 00	$166 46	$161 82
37	108	108 00	144 98	141 29
39	96	96 00	124 72	121 85
41	84	84 00	105 64	103 48
43	72	72 00	87 67	86 11
45	60	60 00	70 71	69 64
47	48	48 00	54 76	54 09
49	36	36 00	39 70	39 33
51	24	24 00	25 59	25 44
53	12	12 00	12 39	12 35

No. 3. ANAHEIM.

SAVINGS, LOAN AND BUILDING ASSOCIATION.

(Incorporated January 8, 1889.)

FRED A. BACKS, JR., Secretary. C. F. GRIM, President.

Fiscal year ended April 30, 1917.

No. of series, 11. No. of members and investors, 177. No. of shares, 2,537.

Assets.		
Loans, on mortgages, $102,550; on shares, $8,230		$110,780 00
Arrearages—		
On shares	$1,279 00	
On interest	700 90	
On fines	68 40	
		2,048 30
Cash, in office, $120.72; in bank, $8,928.99		9,049 71
Advances, ledger accounts		9 44
Total assets		$121,887 45

Liabilities.	
Installment shares, dues	$73,554 00
Installment shares, profits	23.018 31
Investment notes, principal	12,910 00
Advance payments	61 20
Overdrafts and bills payable	10,840 00
Reserve and undivided profits	713 14
Loans due and incomplete	790 80
Total liabilities	$121,887 45

Receipts for Fiscal Year.	
Balance from last report	$8,319 54
Installment shares, dues	15,295 00
Interest	8,521 25
Fines	68 10
Fees	17 50
Loans repaid	20,095 00
Overdrafts and bills payable	650 00
Advances repaid, personal accounts	12 04
All other receipts	331 53
Total receipts	$53,309 96

Disbursements for Fiscal Year.	
Overdrafts and bills payable	$8,726 62
Loans on mortgages and shares	22,739 20
Interest paid	1,703 08
Dues repaid, installment shares	7,498 50
Profits repaid, installment shares	2,818 26
Salaries	600 00
Taxes	158 22
Other expenses	16 37
Balance, cash in office and bank	9,049 71
Total disbursements	$53,309 96

Installment Shares, With Age, Value, and Withdrawal Value.

Serial No.	Age in months	Total dues per share	Book value per share	Withdrawal value
19	120	$60 00	$89 96	$85 46
20	108	54 00	77 63	72 90
21	96	48 00	66 22	61 66
22	84	42 00	55 66	51 56
23	72	36 00	45 79	42 36
24	60	30 00	36 63	33 98
25	48	24 00	28 15	26 08
26	36	18 00	20 28	18 91
27	24	12 00	13 00	12 20
28	12	6 00	6 25	6 03

No. 4. BAKERSFIELD.

KERN COUNTY MUTUAL BUILDING AND LOAN ASSOCIATION.

(Incorporated July 29, 1901.)

ARTHUR S. CRITES, Secretary. J. F. DUGAN, President.

Fiscal year ended December 31, 1916.

No. of series, none. No. of members and investors, 587. No. of shares, 12,185.

Assets.	
Loans, on mortgages	$369,703 80
Arrearages, on interest	4,208 89
Cash in bank	8,591 34
Real estate owned	542 16
Advances, ledger accounts	747 25
Total assets	$383,793 44

Liabilities.	
Installment shares, dues	$205,167 72
Installment shares, profits	73,882 49
Paid-up and prepaid shares, capital	79,950 00
Reserve and undivided profits	14,172 48
Loans due and incomplete	10,620 75
Total liabilities	$383,793 44

Receipts for Fiscal Year.	
Balance from last report	$11,003 12
Installment shares, dues	133,460 04
Paid-up and prepaid shares, dues	48,000 00
Interest	34,973 27
Fines	73 32
Loans repaid	96,845 11
Advances repaid, personal accounts	135 80
All other receipts, real estate, etc.	2,448 38
Total receipts	$326,939 04

Disbursements for Fiscal Year.	
Loans on mortgages and shares	$135,512 76
Dues repaid, installment shares	135,535 94
Profits repaid, installment shares	26,431 64
Paid-up and prepaid shares, capital	13,300 00
Paid-up and prepaid shares, dividends	3,379 50
Advances, personal accounts	410 51
Salaries	2,678 00
Taxes	577 51
Other expenses	403 41
All other disbursements	118 43
Balance, cash in office and bank	8,591 34
Total disbursements	$326,939 04

Installment Shares, With Age, Value, and Withdrawal Value.

Dayton plan.
Dues 50 cents per share per month.
Dividend, last fiscal year, 10 per cent.
Book value, dues plus dividend.
Withdrawal value, full book value.

No. 5. BAKERSFIELD.

PEOPLES MUTUAL BUILDING AND LOAN ASSOCIATION.

(Incorporated January 27, 1892.)

E. W. SPIERS, Secretary. F. W. ROBINSON, President.

Fiscal year ended January 31, 1917.

No. of series, 16. No. of members and investors, 212. No. of shares, 2,966.

Assets.		
Loans, on mortgages, $153,350; on shares, $1,050		$154,400 00
Arrearages—		
On shares	$593 10	
On interest	671 94	
		1,265 04
Cash in bank		16,580 44
Real estate owned		500 00
Advances, ledger accounts		102 50
Total assets		$172,847 98

Liabilities.	
Installment shares, dues	72,194 40
Installment shares, profits	28,744 88
Paid-up and prepaid shares, capital	58,800 00
Reserve and undivided profits	13,108 70
Total liabilities	$172,847 98

Receipts for Fiscal Year.	
Balance from last report	$6,603 88
Installment shares, dues	20,218 00
Paid-up and prepaid shares, dues	2,000 00
Interest	16,764 92
Fines	102 65
Fees	2 00
Loans repaid	41,945 00
Overdrafts and bills payable	8,000 00
Advances repaid, personal accounts	2,560 63
Total receipts	$98,197 08

Disbursements for Fiscal Year.	
Overdraft and bills payable	$8,000 00
Loans on mortgages and shares	36,950 00
Interest paid	100 75
Dues repaid, installment shares	18,225 70
Profits repaid, installment shares	7,412 87
Paid-up and prepaid shares, capital	1,400 00
Paid-up and prepaid shares, dividends	3,538 00
Advances, personal accounts	2,643 63
Salaries	1,830 00
Taxes	490 34
Other expenses	412 50
All other disbursements, real estate	612 85
Balance, cash in office and bank	16,580 44
Total disbursements	$98,197 08

Installment Shares, With Age, Value, and Withdrawal Value.

Serial No.	Age in months	Total dues per share	Book value per share	Withdrawal value
18	96	$57 60	$94 72	$92 50
20	84	50 40	78 10	95 50
22	72	43 20	63 06	59 50
24	60	36 00	49 44	46 50
26	48	28 80	37 24	35 00
28	36	21 60	26 24	25 00
30	24	14 40	16 40	15 50
32	12	7 20	7 70	7 50

No. 6. BERKELEY.

BERKELEY HOME INVESTMENT ASSOCIATION.

(Incorporated December 7, 1908.)

FREDERICK H. CLARK, Secretary. A. E. SHAW, President.

Fiscal year ended March 31, 1917.

No. of series, none. No. of members and investors, 120. No. of shares, 517.

Assets.	
Loans, on definite contract, $15,907.25; on shares, $150; on contract sales, $3,368.09	$19,425 34
Arrearages, on interest	126 68
Cash, in office, $71.17; in bank, $722.79	793 96
Real estate owned	8,432 15
Furniture and fixtures	525 00
Other assets	2 00
Total assets	$29,305 13

Liabilities.	
Guarantee stock, capital	$16,100 00
Guarantee stock, surplus	1,207 50
Installment shares, dues	5,073 57
Installment shares, profits	1,041 22
Paid-up and prepaid shares, capital	2,000 00
Paid-up and prepaid shares, dividends	41 00
Investment certificates, principal	1,997 30
Investment certificates, dividends	102 97
Reserve and undivided profits	1,641 57
All other liabilities, suspense	100 00
Total liabilities	$29,305 13

Receipts for Fiscal Year.	
Balance from last report	$482 19
Installment shares, dues	932 92
Investment certificates	218 97
Interest	2,174 32
Fines	4 57
Loans repaid	13,794 05
Overdrafts and bills payable	1,850 00
All other receipts, real estate, etc.	3,880 39
Total receipts	$23,337 41

Disbursements for Fiscal Year.	
Overdrafts and bills payable	$2,850 00
Loans on mortgages and shares	3,401 32
Interest paid	37 41
Dues repaid, installment shares	1,426 05
Profits repaid, installment shares	260 61
Paid-up and prepaid shares, capital	5,000 00
Paid-up and prepaid shares, dividends	316 30
Investment certificates, principal	988 26
Investment certificates, dividends	192 63
Salaries	200 00
Taxes	74 50
Other expenses	320 46
All other disbursements, real estate, etc.	7,475 91
Balance, cash in office and bank	793 96
Total disbursements	$23,337 41

Installment Shares, With Age, Value, and Withdrawal Value.

Dayton plan.
Dues 50 cents per share per month.
Dividend, last fiscal year, 6 per cent.
Book value, dues plus dividend.
Withdrawal value, dues plus 6 per cent simple interest.

No 7. CORONA.

CORONA MUTUAL BUILDING AND LOAN ASSOCIATION.

(Incorporated October 2, 1905.)

JOHN P. KEY, Secretary. GEO. P. SNIDECOR, President.

Fiscal year ended September 30, 1916.

No. of series, none. No. of members and investors, 99. No. of shares, 351.

Assets.		Liabilities.	
Loans, on mortgages, $1,850; on definite contract, $39,557.63	$41,407 63	Guarantee stock, capital	$5,000 00
Cash in bank	144 82	Guarantee stock, surplus	400 00
		Installment shares, dues	4,917 44
		Installment shares, profits	1,070 27
		Investment certificates, principal	17,188 24
		Investment certificates, dividends	398 61
		Overdrafts and bills payable	12,400 00
		Reserve and undivided profits	113 08
		Sundry ledger accounts	64 81
Total assets	$41,552 45	Total liabilities	$41,552 45

Receipts for Fiscal Year.		Disbursements for Fiscal Year.	
Balance from last report	$29 35	Overdrafts and bills payable	$16,045 00
Installment shares, dues	3,864 04	Loans on mortgages and shares	14,157 01
Investment certificates	18,872 21	Interest paid	828 91
Interest	3,261 73	Dividends on guarantee stock	700 00
Fines and fees	148 83	Dues repaid, installment shares	5,168 61
Loans repaid	8,440 52	Profits repaid, installment shares	363 04
Overdrafts and bills payable	15,830 00	Investment certificates, principal	11,216 78
Advances repaid, personal accounts	64 81	Investment certificates, dividends	1,097 85
		Salaries	480 00
		Taxes	48 25
		Other expenses	261 22
		Balance, cash in office and bank	144 82
Total receipts	$50,511 49	Total disbursements	$50,511 49

Installment Shares, With Age, Value, and Withdrawal Value.

Dayton plan.
Dues 50 cents per share per month.
Dividend, last fiscal year, 8 per cent.
Book value, dues plus dividend.
Withdrawal value, same as book value.

No. 8. ESCONDIDO.

ESCONDIDO MUTUAL BUILDING AND LOAN ASSOCIATION.

(Reincorporated December 20, 1913.)

F. G. BALDRIDGE, Secretary. W. H. BALDRIDGE, President.

Fiscal year ended February 28, 1917.

No. of series, 13. No. of members and investors, 54. No. of shares, 552.

Assets.		
Loans, on mortgages		$22,400 00
Arrearages—		
On shares	$33 00	
On interest	20 38	
On premium	3 30	
On fines	4 14	
		60 82
Cash, in office, $28.02; in bank, $3,797.32		3,825 34
Furniture and fixtures		80 56
Total assets		$26,366 72

Liabilities.	
Installment shares, dues	$21,126 00
Installment shares, profits	4,112 33
Advance payments	108 82
Reserve and undivided profits	298 22
Sundry ledger accounts, matured shares	721 35
Total liabilities	$26,366 72

Receipts for Fiscal Year.	
Balance from last report	$2,121 07
Installments shares, dues	6,653 00
Interest	1,745 34
Premiums	266 70
Fines	65
Fees	4 84
Loans repaid	4,400 00
Total receipts	$15,191 60

Disbursements for Fiscal Year.	
Loans on mortgages and shares	$2,600 00
Interest paid	151 94
Dues repaid, installment shares	4,841 00
Profits repaid, installment shares	1,183 07
Paid-up and prepaid shares, capital	2,312 50
Salaries	204 00
Taxes	25 00
Other expenses	48 75
Balance, cash in office and bank	3,825 34
Total disbursements	$15,191 60

Installment Shares, With Age, Value, and Withdrawal Value.

Serial No.	Age in months	Total dues per share	Book value per share	Withdrawal value
30	78	$78 00	$104 34	$97 76
31	72	72 00	93 79	88 34
33	60	60 00	74 27	70 71
35	48	48 00	56 69	53 45
37	36	36 00	40 42	39 31
39	24	24 00	25 76	25 32
41	12	12 00	12 39	12 30

No. 9. FRESNO.

MUTUAL BUILDING AND LOAN ASSOCIATION.

(Incorporated March 17, 1892.)

WICK W. PARSONS, Secretary. W. T. MATTINGLY, President.

Fiscal year ended February 28, 1917.

No. of series, 20. No. of members and investors, 216. No. of shares, 2,632.

Assets.

Loans, on definite contract		$163,703 92
Arrearages—		
On shares	$123 10	
On interest	248 30	
		371 40
Cash in bank		6,500 76
Total assets		$170,576 08

Liabilities.

Installment shares, dues	$99,835 80
Installment shares, profits	42,458 78
Overdrafts and bills payable	20,000 00
Reserve and undivided profits	3,467 65
Loans due and incomplete	4,813 85
Total liabilities	$170,576 08

Receipts for Fiscal Year.

Balance from last report	$6,206 97
Installment shares, dues	19,363 30
Interest	15,571 56
Fines	57 65
Fees	2 00
Loans repaid	78,730 87
Overdrafts and bills payable	10,000 00
Advances repaid, personal accounts	4 20
Total receipts	$129,936 55

Disbursements for Fiscal Year.

Overdrafts and bills payable	$37,500 00
Loans on mortgages and shares	71,802 66
Interest paid	2,390 83
Dues repaid, installment shares	6,210 40
Profits repaid, installment shares	3,749 40
Advances, personal accounts	4 20
Salaries	1,140 00
Taxes	533 50
Other expenses	104 80
Balance, cash in office and bank	6,500 76
Total disbursements	$129,936 55

Installment Shares, With Age, Value, and Withdrawal Value.

Serial No.	Age in months	Total dues per share	Book value per share	Withdrawal value
31	120	$120 00	$206 20	$206 20
33	108	108 00	175 27	175 27
35	96	96 00	147 14	147 14
37	84	84 00	121 47	121 41
39	72	72 00	98 19	98 19
41	60	60 00	77 28	77 28
43	48	48 00	58 54	58 54
45	36	36 00	41 71	41 74
47	24	24 00	26 46	26 46
49	12	12 00	12 61	12 61

No. 10. FORTUNA.

FORTUNA BUILDING AND LOAN ASSOCIATION.

(Incorporated April 30, 1889.)

C. A. Friedenbach, Secretary. H. T. Natwick, President.

Fiscal year ended May 31, 1917.

No. of series, 13. No. of members and investors, 90. No. of shares, 631

Assets.		
Loans, on mortgages, $26,100; on shares, $200		$26,300 00
Arrearages—		
On shares	$45 00	
On interest	25 85	
On fines	5 35	
		76 20
Cash in bank		3,049 49
Real estate owned		566 19
Total assets		$29,991 88

Liabilities.	
Installment shares, dues	$24,501 00
Installment shares, profits	4,430 93
Advance payments	25 00
Reserve and undivided profits	1,034 95
Total liabilities	$29,991 88

Receipts for Fiscal Year.	
Balance from last report	$1,178 63
Installment shares, dues	7,872 50
Interest	2,410 60
Fines	57 65
Fees	24 40
Loans repaid	5,050 00
Advances repaid, personal accounts	58 66
Total receipts	$16,652 44

Disbursements for Fiscal Year.	
Loans on mortgages and shares	$1,900 00
Interest paid	30 70
Dues repaid, installment shares	8,478 00
Profits repaid, installment shares	2,358 80
Salaries	180 00
Other expenses	87 20
All other disbursements, real estate, etc.	568 25
Balance, cash in office and bank	3,049 49
Total disbursements	$16,652 44

Installment Shares, With Age, Value, and Withdrawal Value.

Serial No.	Age in months	Total dues per share	Book value per share	Withdrawal value
43	78	$78 00	$99 64	$96 93
44	72	72 00	90 23	87 95
46	60	60 00	72 36	70 81
48	48	48 00	55 71	53 78
50	36	36 00	40 20	38 62
52	24	24 00	25 80	24 90
54	12	12 00	12 44	12 20

No. 11. LIVERMORE.

LIVERMORE MUTUAL BUILDING AND LOAN ASSOCIATION.

(Incorporated September 19, 1906.)

C. F. WENTE, Secretary. J. O. MCKOWN, President.

Fiscal year ended September 30, 1916.

No. of series, 12. No. of members and investors, 47. No. of shares, 434.

Assets.	
Loans, on mortgages, $33,536.07; on shares, $100	$33,636 07
Arrearages, on shares	7 00
Cash in bank	1,165 25
Total assets	$34,808 32

Liabilities.	
Installment shares, dues	$23,550 00
Installment shares, profits	5,556 15
Advance payments	40 00
Overdrafts and bills payable	5,000 00
Reserve and undivided profits	662 17
Total liabilities	$34,808 32

Receipts for Fiscal Year.	
Balance from last report	$582 70
Installment shares, dues	5,321 00
Interest	2,527 37
Fees	8 90
Loans repaid	6,250 72
Overdrafts and bills payable	5,000 00
Total receipts	$19,690 69

Disbursements for Fiscal Year.	
Overdrafts and bills payable	$7,000 00
Loans on mortgages and shares	9,261 79
Interest paid	468 18
Dues repaid, installment shares	1,075 00
Profits repaid, installment shares	229 63
Salaries	200 00
Taxes	262 84
Other expenses	28 00
Balance, cash in office and bank	1,165 25
Total disbursements	$19,690 69

Installment Shares, With Age, Value, and Withdrawal Value.

Serial No.	Age in months	Total dues per share	Book value per share	Withdrawal value
1	120	$120 00	$164 52	$160 07
3	108	108 00	143 59	140 04
5	84	84 00	104 35	102 32
6	72	72 00	86 48	85 04
8	48	48 00	54 19	53 58
9	36	36 00	39 44	39 10
10	24	24 00	25 52	25 37
11	12	12 00	12 39	12 35

No. 12. LONG BEACH.

MUTUAL BUILDING AND LOAN ASSOCIATION.

(Incorporated August 4, 1904.)

W. S. STEVENS, Secretary. LLEWELLYN BIXBY, President.

Fiscal year ended December 30, 1916.

No. of series, none. No. of members and investors, 355. No. of shares, 1,366.

Assets.	
Loans, on mortgages, $3,875; on definite contract, $273,378.08; on shares, $2,100; on contract sales, bonds, $13,500	$292,853 08
Arrearages, on interest	1,030 99
Cash, in office, $2,962.29; in bank, $44,878.68	47.840 97
Furniture and fixtures	740 99
Total assets	$342,466 03

Liabilities.	
Guarantee stock, capital	$25,000 00
Guarantee stock, surplus	2,500 00
Installment shares, dues	25,654 65
Installment shares, profits	10,910 59
Investment certificates, principal	260,203 78
Investment certificates, dividends	14,451 34
Reserve and undivided profits	3,745 67
Total liabilities	342,466 03

Receipts for Fiscal Year.	
Balance from last report	$24,695 09
Guarantee stock and surplus	27.500 00
Installment shares, dues	8,539 28
Investment certificates	218.429 36
Interest	18,828 10
Fees	1.245 97
Loans repaid	109,155 12
Advances repaid, personal accounts	269 23
All other receipts, real estate	2,910 58
Total receipts	$411,572 73

Disbursements for Fiscal Year.	
Loans on mortgages and shares	$225,476 37
Interest paid	484 11
Dividends on guarantee stock	1,125 00
Dues repaid, installment shares	26,890 77
Profits repaid, installment shares	5,387 33
Investment certificates, principal	94,498 46
Investment certificates, dividends	5,797 51
Advances, personal accounts	170 66
Salaries	1.400 00
Taxes	161 63
Other expenses	1,598 93
All other disbursements, furniture and fixtures	740 99
Balance, cash in office and bank	47,840 97
Total disbursements	$411,572 73

Installment Shares, With Age, Value, and Withdrawal Value.

Dayton plan.
Dues 50 cents per share per month.
Dividend, last fiscal year, 8 per cent.
Book value, dues plus dividend.
Withdrawal value, full book value.

No. 13. LOS ANGELES.

BANKERS GUARANTY-LOAN COMPANY.

(Incorporated August 12, 1901.)

G. H. Wadleigh, Secretary. John H. Foley, President.

Fiscal year ended December 31, 1916.)

No. of series, none. No. of members and investors, 26. No. of shares, 861.

Assets.	
Loans, on definite contract, $12,186.86; on shares, $50; on contract sales, $452.67	$12,689 53
Cash, in office, $450.76; in bank, $13,761.54	14,212 30
Real estate owned	1,500 00
Advances, ledger accounts	169 38
Total assets	$28,571 21

Liabilities.	
Guarantee stock, capital	$16,030 00
Paid-up and prepaid shares, capital	3,348 50
Paid-up and prepaid shares, dividends	1,001 87
Investment certificates, principal	7,052 75
Investment certificates, dividends	722 55
Sundry ledger accounts	415 54
Total liabilities	$28,571 21

Receipts for Fiscal Year.	
Balance from last report	$5,698 51
Investment certificates	1,288 22
Interest	1,785 93
Loans repaid	3,692 75
Advances repaid, personal accounts	13 73
All other receipts, real estate, etc.	6,424 71
Total receipts	$18,903 85

Disbursements for Fiscal Year.	
Interest paid	901 18
Investment certificates, principal	3,084 65
Other expenses	60 56
All other disbursements, real estate, etc.	645 16
Balance, cash in office and bank	$14,212 30
Total disbursements	$18,903 85

Installment Shares, With Age, Value, and Withdrawal Value.

Dayton plan.
Dues 60 cents per share per month.
Dividend, last fiscal year, 6 per cent.
Book value, dues plus dividend.
Withdrawal value, same as book value.

No. 14. LOS ANGELES.

FIDELITY SAVINGS AND LOAN ASSOCIATION.

(Incorporated January 31, 1891.)

G. H. WADLEIGH, Secretary. C. C. BOYNTON, President.

Fiscal year ended December 31, 1916.

No. of series, none. No. of members and investors, 6,000. No. of shares, 69,816.

Assets.	
Loans, on mortgages, $3,982,187.59; on definite contract, $2,445,223.14; on shares, $149,107.35	$6,576,518 08
Arrearages, on interest	1,828 78
Cash, in office, $1,542.42; in bank, $280,713.24	282,255 66
Real estate owned	463,566 11
Advances, ledger accounts	91,415 40
Total assets	$7,415,584 03

Liabilities.	
Guarantee stock, subscriptions	$133,297 25
Installment shares, dues	1,662,330 05
Installment shares, profits	762,291 80
Paid-up and prepaid shares, capital	1,834,500 00
Paid-up and prepaid shares, dividends	8,796 67
Investment certificates, principal	1,814,176 67
Investment certificates, dividends	23,907 64
Overdrafts and bills payable	54,187 15
Reserve and undivided profits	506,587 86
Loans due and incomplete	494,621 41
Sundry ledger accounts	113,282 03
All other liabilities, tax reserve, etc.	7,605 50
Total liabilities	$7,415,584 03

Receipts for Fiscal Year.	
Balance from last report	$339,566 90
Guarantee stock subscriptions	72,798 55
Installment shares, dues	416,119 56
Paid-up and prepaid shares, dues	823,500 00
Investment certificates	276,584 00
Interest	600,401 70
Premiums	35,098 80
Fines and fees	14,946 93
Loans repaid	3,666,987 95
Overdrafts and bills payable	56,745 08
Advances repaid, personal accounts, net	248,633 85
All other receipts, real estate, etc.	777,891 08
Total receipts	$7,329,274 40

Disbursements for Fiscal Year.	
Overdrafts and bills payable	$46,867 56
Loans on mortgages and shares	4,398,300 88
Interest paid	16,273 95
Dividends on guarantee stock subscription	6,351 33
Dues repaid, installment shares	438,939 55
Profits repaid, installment shares	366,853 81
Paid-up and prepaid shares, capital	98,600 00
Paid-up and prepaid shares, dividends	118,189 38
Investment certificates, principal	251,123 67
Investment certificates, dividends	141,494 77
Salaries	20,400 00
Taxes	5,111 45
Other expenses	48,009 07
All other disbursements, real estate, etc.	1,090,503 32
Balance, cash in office and bank	282,255 66
Total disbursements	$7,329,274 40

Installment Shares, With Age, Value, and Withdrawal Value.

	Age in months	Total dues per share	Loan fund dues per share	Book value per share	Withdrawal value
	91	$63 40	$55 26	$100 00	$100 00
Class "B." Dues 70 cents per share per month.	84	58 80	51 12	88 17	88 17
	72	50 40	43 46	68 97	68 97
	60	42 00	36 00	52 42	52 42
	48	33 60	28 44	38 15	38 15
	36	25 20	20 88	25 85	25 85
	24	16 80	13 32	15 25	15 25
	12	8 40	5 76	6 11	6 11

No. 15. LOS ANGELES.

HOME INVESTMENT BUILDING AND LOAN ASSOCIATION.

(Incorporated August 21, 1889.)

W. A. BONYNGE, Secretary. I. B. NEWTON, President.

Fiscal year ended September 30, 1916.

No. of series, 16. No. of members and investors, 42. No. of shares, 551.

Assets.		
Loans, on mortgages		$46,800 00
Arrearages—		
On shares	$112 00	
On interest	311 49	
		423 49
Cash in bank		381 80
Furniture and fixtures		100 00
Total assets		$47,705 29

Liabilities.	
Installment shares, dues	$19,887 00
Installment shares, profits	3,536 04
Advance payments	175 00
Overdrafts and bills payable	23,550 00
Reserve and undivided profits	557 25
Total liabilities	$47,705 29

Receipts for Fiscal Year.	
Balance from last report	431 58
Installment shares, dues	6,361 00
Interest	3,368 44
Fines	63 80
Loans repaid	9,000 00
Overdrafts and bills payable	15,100 00
Advances repaid, personal accounts	429 07
Total receipts	$34,753 89

Disbursements for Fiscal Year.	
Overdrafts and bills payable	$9,360 00
Loans on mortgages and shares	18,500 00
Interest paid	1,263 11
Dues repaid, installment shares	3,039 00
Profits repaid, installment shares	954 46
Advances, personal accounts	426 97
Salaries	420 00
Taxes	291 00
Other expenses	117 55
Balance, cash in office and bank	381 80
Total disbursements	$34,753 89

Installment Shares, With Age, Value, and Withdrawal Value.

Serial No.	Age in months	Total dues per share	Book value per share	Withdrawal value
35	120	$120 00	$168 78	$168 78
38	102	102 00	136 06	136 65
39	96	96 00	125 80	122 82
41	84	84 00	106 18	102 85
43	72	72 00	87 71	84 50
44	66	66 00	79 00	75 75
47	48	48 00	54 41	52 80
49	36	36 00	39 43	38 57
51	24	24 00	25 47	25 10
53	12	12 00	12 36	12 27

No. 16. LOS ANGELES.

METROPOLITAN LOAN ASSOCIATION.

(Incorporated July 30, 1886.)

ISAAC NORTON, Secretary. J. W. MONTGOMERY, President.

Fiscal year ended June 30, 1917.

No. of series, 22. No. of members and investors, 182. No. of shares, 2,847.

Assets.

Loans, on mortgages, $231,300; on shares, $11,600		$242,900 00
Arrearages—		
On shares	$656 00	
On interest	845 65	
		1,501 65
Cash in bank		22,743 22
Advances, ledger accounts		32 65
Total assets		$267,177 52

Liabilities.

Installment shares, dues	$175,542 00
Installment shares, profits	46,708 48
Paid-up and prepaid shares, capital	25,300 00
Advance payments	624 25
Reserve and undivided profits	11,036 23
Loans due and incomplete	7,208 40
Sundry ledger accounts	758 16
Total liabilities	$267,177 52

Receipts for Fiscal Year.

Balance from last report	$17,552 72
Installment shares, dues	34,694 00
Paid-up and prepaid shares, dues	4,500 00
Interest	18,138 61
Fines	62 02
Loans repaid	30,600 00
Advances repaid, personal accounts	899 19
Total receipts	$106,446 54

Disbursements for Fiscal Year.

Loans on mortgages and shares	41,091 60
Dues repaid, installment shares	25,844 00
Profits repaid, installment shares	9,860 54
Paid-up and prepaid shares, capital	1,000 00
Paid-up and prepaid shares, dividends	1,465 50
Advances, personal accounts	32 65
Salaries	3,360 00
Taxes	326 46
Other expenses	722 57
Balance, cash in office and bank	22,743 22
Total disbursements	$106,446 54

Installment Shares, With Age, Value, and Withdrawal Value.

Serial No.	Age in months	Total dues per share	Book value per share	Withdrawal value
33	120	$120 00	$169 22	$159 38
35	108	108 00	146 69	137 02
37	96	96 00	125 87	116 91
39	84	84 00	106 55	98 65
41	72	72 00	88 40	81 84
43	60	60 00	71 30	66 78
45	48	48 00	55 18	51 59
47	36	36 00	39 99	38 00
49	24	24 00	25 74	24 87
51	12	12 00	12 43	12 22

No. 17. LOS ANGELES.

STATE MUTUAL BUILDING AND LOAN ASSOCIATION.

(Incorporated June 20, 1889.)

C. J. Wade, Secretary.. W. G. Cochran, President

Fiscal year ended December 31, 1916.

No. of series, none. No. of members and investors, 2,467. No. of shares, 8,721.

Assets.		
Loans, on street bonds, $2,669.23; on definite contract, $3,816,347.15; on shares, $19,032.81; on contract sales, $20,778.35		$3,858,827 54
Arrearages—		
On interest	$12,877 70	
On fines	1,318 20	
		14,195 90
Cash, in office, $16,581.53; in bank, $363,160.80		379,742 33
Real estate owned		16,386 90
Furniture and fixtures		707 08
Advances, ledger accounts		27,188 19
Total assets		$4,297,047 94

Liabilities.	
Guarantee stock, capital	$200,000 00
Guarantee stock, surplus	93,871 40
Installment shares, dues	79,119 00
Installment shares, profits	40,162 00
Paid-up and prepaid shares, capital	323,645 00
Paid-up and prepaid shares, dividends	45,413 00
Investment certificates, principal	3,394,990 40
Investment certificates, dividends	100,937 45
Advance payments	1,264 90
Reserve and undivided profits	7,387 64
Loans due and incomplete	8,033 57
Sundry ledger accounts	2,223 58
Total liabilities	$4,297,047 94

Receipts for Fiscal Year.	
Balance from last report	$216,568 86
Installment shares, dues	44,939 50
Paid-up and prepaid shares, dues	51,500 00
Investment certificates	554,009 35
Interest	350,521 47
Fines	5,962 90
Fees	2,487 00
Loans repaid	1,393,188 75
Advances repaid, personal accounts	16,873 99
All other receipts, real estate, etc	19,880 74
Total receipts	$2,655,932 56

Disbursements for Fiscal Year.	
Loans on mortgages and shares	$1,429,520 91
Dividends on guarantee stock	24,000 00
Dues repaid, installment shares	40,717 45
Profits repaid, installment shares	27,564 20
Paid-up and prepaid shares, capital	3,462 50
Paid-up and prepaid shares, dividends	28,442 05
Investment certificates, principal	405,316 55
Investment certificates, dividends	192,233 34
Advances, personal accounts	32,176 82
Salaries	15,900 00
Taxes	4,837 47
Other expenses	37,292 59
All other disbursements, real estate, etc.	34,726 35
Balance, cash in office and bank	379,742 33
Total disbursements	$2,655,932 56

Installment Shares, With Age, Value, and Withdrawal Value.

Dayton plan.
Dues, $1.00 per share per month.
Dividend, last fiscal year, 9 per cent.
Book value, dues plus dividend.
Withdrawal value, full book value.

No. 18. LOS ANGELES.

SOUTHERN CALIFORNIA LOAN ASSOCIATION.

(Incorporated March 11, 1887.)

JULIUS H. MARTIN, Secretary. CHARLES E. DONNATIN, President.

Fiscal year ended June 30, 1917.

No. of series, 22. No. of members and investors, 550. No. of shares, 2,261.

Assets.	
Loans, on mortgages	$917,593 00
Arrearages, on shares	244 00
Cash in bank	10,235 32
Real estate owned	3,389 40
Advances, ledger accounts	1,039 56
Total assets	$932,501 28

Liabilities.	
Guarantee stock, capital	$51,000 00
Guarantee stock, surplus	1,510 00
Installment shares, dues	96,288 00
Installment shares, profits	28,216 48
Investment certificates, principal	723,219 31
Advance payments	282 00
Reserve and undivided profits	22,183 36
Loans due and incomplete	9,802 13
Total liabilities	$932,501 28

Receipts for Fiscal Year.	
Balance from last report	$8,276 80
Guarantee stock	1,000 00
Installment shares, dues	20,867 00
Investment certificates	188,644 58
Interest	67,338 95
Loans repaid	194,293 00
Overdrafts and bills payable	30,000 00
Advances repaid, personal accounts	17,274 38
All other receipts, real estate, etc.	6,439 46
Total receipts	$534,134 17

Disbursements for Fiscal Year.	
Overdrafts and bills payable	$35,000 00
Loans on mortgages and shares	297,923 31
Interest paid	113 34
Dividends on guarantee stock	6,000 00
Dues repaid, installment shares	16,210 00
Profits repaid, installment shares	6,938 98
Investment certificates, principal	84,152 23
Investment certificates, dividends	39,966 93
Advances, personal accounts	17,340 86
Salaries	4,307 00
Taxes	3,732 74
Other expenses	2,639 33
All other disbursements, real estate, etc.	9,574 13
Balance, cash in office and bank	10,235 32
Total disbursements	$534,134 17

Installment Shares, With Age, Value, and Withdrawal Value.

Serial No.	Age in months	Total dues per share	Book value per share	Withdrawal value
37	118	$118 00	$170 28	$170 28
39	106	106 00	147 11	147 11
41	94	94 00	125 50	117 64
43	84	84 00	108 71	102 53
45	72	72 00	89 73	82 64
47	60	60 00	72 04	67 21
49	48	48 00	55 55	52 53
51	36	36 00	40 15	38 49
53	24	24 00	25 81	25 09
55	12	12 00	12 46	12 28

No. 19. LOS GATOS.

LOS GATOS BUILDING AND LOAN ASSOCIATION.

(Incorporated April 27, 1889.)

E. G. ANGELL, Secretary. E. M. SELLERS, President.

Fiscal year ended December 31, 1916.

No. of series, 9. No. of members and investors, 21. No. of shares, 82.

Assets.		
Loans on mortgages		$8,365 91
Arrearages—		
On shares	$104 50	
On interest	145 65	
On fines	20 25	
		270 40
Cash in bank		14 65
Total assets		8,650 96

Liabilities.	
Installment shares, dues	4,988 00
Installment shares, profits	1,968 63
Advance payments	22 00
Overdrafts and bills payable	700 00
Reserve and undivided profits	972 33
Total liabilities	$8,650 96

Receipts for Fiscal Year.	
Balance from last report	$151 85
Installment shares, dues	836 50
Interest	525 35
Premiums	218 25
Fines	51 15
Fees	60
Loans repaid	4,812 25
Overdrafts and bills payable	800 00
All other receipts	11 00
Total receipts	$7,406 95

Disbursements for Fiscal Year.	
Overdrafts and bills payable	$3,200 00
Loans on mortgages and shares	1,385 66
Interest paid	154 27
Dues repaid, installment shares	1,633 10
Profits repaid, installment shares	791 74
Salaries	180 00
Taxes	9 56
Other expenses	37 97
Balance, cash in office and bank	14 65
Total disbursements	7,406 95

Installment Shares, With Age, Value, and Withdrawal Value.

Serial No.	Age in months	Total dues per share	Book value per share	Withdrawal value
13	116	$116 00	$187 54	
14	104	104 00	160 73	Dues plus profits as per by-laws.
15	92	92 00	136 02	
17	68	68 00	91 14	
18	56	56 00	71 49	
19	44	44 00	53 69	
20	32	32 00	37 28	
21	20	20 00	22 16	
22	8	8 00	8 35	

No. 20. MADERA.

MADERA MUTUAL BUILDING AND LOAN ASSOCIATION.

(Incorporated October 26, 1912.)

E. M. McCardle, Secretary. J. B. High, President.

Fiscal year ended October 31, 1916.

No. of series, none. No. of members and investors, 68. No. of shares, 710.

Assets.		
Loans, on definite contract		$29,297 64
Arrearages—		
On shares	$929 00	
On interest	115 18	
		1,044 18
Cash, in office, $154.50; in bank, $2,178.35		2,332 85
Total assets		$32,674 67

Liabilities.	
Installment shares, dues	$28,229 50
Installment shares, profits	3,035 85
Advance payments	56 00
Reserve and undivided profits	303 32
Loans due and incomplete	1,050 00
Total liabilities	$32,674 67

Receipts for Fiscal Year.	
Balance from last report	$2,526 83
Installment shares, dues	8,411 00
Interest	2,282 54
Fines	18 24
Fees	115 00
Loans repaid	3,724 74
Total receipts	$17,078 35

Disbursements for Fiscal Year.	
Loans on mortgages and shares	$11,600 00
Dues repaid, installment shares	2,501 00
Profits repaid, installment shares	182 40
Salaries	420 00
Taxes	35 00
Other expenses	7 10
Balance, cash in office and bank	2,332 85
Total disbursements	$17,078 35

Installment Shares, With Age, Value, and Withdrawal Value.

Dayton plan.
Dues 50 cents per share per month.
Dividend, last fiscal year, 6 per cent.
Book value, dues plus dividend.
Withdrawal value, dues plus profits as per by-laws.

No. 21. MERCED.

MERCED MUTUAL BUILDING AND LOAN ASSOCIATION.

(Incorporated June 22, 1891.)

J. H. Simonson, Secretary. W. E. Landrum, President.

Fiscal year ended June 30, 1917.

No. of series, 11. No. of members and investors, 179. No. of shares, 1,762.

Assets.

Loans, on mortgages, $128,650; on shares, $650		$129,300 00
Arrearages—		
On shares	$511 00	
On interest	672 90	
On fines	141 57	
		1,325 47
Cash in bank		14,672 42
Furniture and fixtures		180 00
Other assets, bonds		200 00
Total assets		$145,677 89

Liabilities.

Installment shares, dues	$108,612 00
Installment shares, profits	32,676 90
Advance payments	15 00
Reserve and undivided profits	4,373 99
Total liabilities	$145,677 89

Receipts for Fiscal Year.

Balance from last report	$14,101 52
Installment shares, dues	22,260 00
Interest	10,176 53
Fines	59 66
Fees	35 10
Loans repaid	29,325 00
Total receipts	$75,957 81

Disbursements for Fiscal Year.

Loans on mortgages and shares	$32,450 00
Dues repaid, installment shares	20,823 00
Profits repaid, installment shares	6,643 35
Salaries	600 00
Taxes	287 89
Other expenses	281 15
All other disbursements, bonds	200 00
Balance, cash in office and bank	14,672 42
Total disbursements	$75,957 81

Installment Shares, With Age, Value, and Withdrawal Value.

Serial No.	Age in months	Total dues per share	Book value per share	Withdrawal value
19	120	$120 00	$173 84	$150 25
20	108	108 00	151 03	132 53
21	96	96 00	129 71	115 40
22	84	84 00	109 64	98 88
23	72	72 00	90 74	82 95
24	60	60 00	72 89	67 63
25	48	48 00	56 18	52 90
26	36	36 00	40 57	38 78
27	24	24 00	26 04	25 25
28	12	12 00	12 54	12 33

No. 22. MILL VALLEY.

TAMALPAIS MUTUAL BUILDING AND LOAN ASSOCIATION.

(Incorporated March 16, 1897.)

PAUL HELMORE, Secretary. N. P. YOST, President.

Fiscal year ended April 30, 1917.

No. of series, 24. No. of members and investors, 135. No. of shares, 1,332.

Assets.

Loans, on mortgages, $7,800; on definite contract, $36,314.52		$44,114 52
Arrearages—		
On shares	$296 49	
On interest	1,818 93	
On fines	27 64	
		2,143 06
Cash, in office, $14.45; in bank, $1,902.39		1,916 84
Real estate owned		4,590 70
Furniture and fixtures		126 75
Other assets		37 37
Total assets		$52,929 24

Liabilities.

Installment shares, dues	$26,393 60
Installment shares, profits	5,034 37
Paid-up and prepaid shares, capital	20,200 00
Reserve and undivided profits	989 87
Sundry ledger accounts	311 40
Total liabilities	$52,929 24

Receipts for Fiscal Year.

Balance from last report	$842 81
Installment shares, dues	8,710 36
Paid-up and prepaid shares, dues	600 00
Interest	4,146 37
Fines	146 70
Fees	15 30
Loans repaid	15,321 63
Total receipts	$29,783 17

Disbursements for Fiscal Year.

Loans on mortgages and shares	$12,200 00
Dues repaid, installment shares	8,262 35
Profits repaid, installment shares	1,579 70
Paid-up and prepaid shares, capital	3,120 00
Paid-up and prepaid shares, dividends	1,255 00
Advances, personal accounts	602 90
Salaries	600 00
Taxes	18 83
Other expenses	227 55
Balance, cash in office and bank	1,916 84
Total disbursements	$29,783 17

Installment Shares, With Age, Value, and Withdrawal Value.

Serial No.	Age in months	Total dues per share	Book value per share	Withdrawal value
44	75	$75 00	$97 72	$97 72
45	72	72 00	92 76	92 76
49	60	60 00	73 92	73 92
53	48	48 00	56 61	56 61
57	36	36 00	40 65	40 65
61	24	24 00	25 94	25 94
65	12	12 00	12 44	12 44

No. 23. NAPA.

NAPA BUILDING AND LOAN ASSOCIATION.

(Incorporated September 8, 1888.)

JOHN N. MOUNT, Secretary. E. D. BEARD, President.

Fiscal year ended May 26, 1917.

No. of series, 12. No. of members and investors, 382. No. of shares, 3 952.

Assets.		
Loans, on mortgages, $228,165.16; on shares, $15,175; on contract sales, $2,136.16		$245,476 32
Arrearages—		
On shares	$374 00	
On interest	219 20	
On fines	308 68	
		901 88
Cash in bank		14,481 81
Furniture and fixtures		150 00
Advances, ledger accounts		45
Total assets		$261,010 46

Liabilities.	
Installment shares, dues	$208,376 00
Installment shares, profits	49,890 31
Advance payments	882 00
Reserve and undivided profits	1,862 15
Total liabilities	$261,010 46

Receipts for Fiscal Year.	
Balance from last report	$2,742 68
Installment shares, dues	45,212 00
Interest	16,105 36
Premiums	25 47
Fines	201 90
Loans repaid	21,467 96
Overdrafts and bills payable	900 00
All other receipts, real estate	4,266 85
Total receipts	$90,922 22

Disbursements for Fiscal Year.	
Overdrafts and bills payable	$14,275 00
Loans on mortgages and shares	46,520 82
Interest paid	368 79
Dues repaid, installment shares	11,358 00
Profits repaid, installment shares	1,953 71
Salaries	1,196 00
Taxes	397 52
Other expenses	200 10
All other disbursements, real estate	170 47
Balance, cash in office and bank	14,481 81
Total disbursements	$90,922 22

Installment Shares, With Age, Value, and Withdrawal Value.

Serial No.	Age in months	Total dues per share	Book value per share	Withdrawal value
22	125	$125 00	$177 17	$157 55
23	113	113 00	154 42	139 60
24	101	101 00	133 18	122 25
25	89	89 00	113 43	105 50
26	77	77 00	94 88	89 35
27	65	65 00	77 45	73 80
28	53	53 00	61 07	58 85
29	41	41 00	45 70	44 50
30	29	29 00	30 29	30 75
31	17	17 00	17 76	17 46

No. 24. NEWCASTLE.

NEWCASTLE BUILDING AND LOAN ASSOCIATION.

(Incorporated May 20, 1889.)

JOHN WALLACE, Secretary. GEO. W. BISBEE, President.

Fiscal year ended April 30, 1917.

No. of series, 11. No. of members and investors, 94. No. of shares, 680.

Assets.		
Loans, on mortgages		$52,100 00
Arrearages—		
On shares	$33 00	
On interest	31 79	
On fines	3 26	
		68 05
Cash, in office, $2.37; in bank, $887.60		889 97
Real estate owned		1,473 53
Furniture and fixtures		50 00
Total assets		$54,581 55

Liabilities.	
Installment shares, dues	$42,420 00
Installment shares, profits	10,389 84
Advance payments	89 67
Reserve and undivided profits	1,608 54
Sundry ledger accounts	73 50
Total liabilities	$54,581 55

Receipts for Fiscal Year.	
Balance from last report	$864 19
Installment shares, dues	8,573 00
Interest	4,313 56
Fines	16 28
Fees	5 00
Loans repaid	3,350 00
Overdrafts and bills payable	6,866 52
All other receipts	66 89
Total receipts	$24,055 44

Disbursements for Fiscal Year.	
Overdrafts and bills payable	$6,866 52
Loans on mortgages and shares	5,600 00
Interest paid	185 23
Dues repaid, installment shares	6,926 00
Profits repaid, installment shares	2,764 77
Salaries	394 00
Taxes	167 48
Other expenses	219 29
All other disbursements	42 18
Balance, cash in office and bank	889 97
Total disbursements	$24,055 44

Installment Shares, With Age, Value, and Withdrawal Value.

Serial No.	Age in months	Total dues per share	Book value per share	Withdrawal value
19	120	$120 00	$164 69	
20	108	108 00	143 50	Dues plus profits as per by-laws
21	96	96 00	123 59	
22	84	84 00	108 86	
23	72	72 00	87 11	
24	60	60 00	70 37	
25	48	48 00	54 59	
26	36	36 00	39 69	
27	24	24 00	25 64	
28	12	12 00	12 42	

No. 25. OAKLAND.

ALAMEDA COUNTY LOAN ASSOCIATION.

(Incorporated July 20, 1875.)

C. P. Hoag, Secretary. J. B. Richardson, President.

Fiscal year ended June 30, 1917.

No. of series, none. No. of members and investors, 668. No. of shares, 3,455.

Assets.	
Loans, on definite contract, $409,261.42; on shares, $1,530; on contract sales, $17,422.52	$428,213 94
Arrearages, on interest	940 71
Cash, in office, $200; in bank, $39,225.13	39,425 13
Real estate owned (office building, $57,198.85)	81,812 69
Furniture and fixtures	450 00
Advances, ledger accounts	259 44
Other assets, gov't bonds	2,500 00
Total assets	$553,601 91

Liabilities.	
Installment shares, dues	$202,649 32
Installment shares, profits	45,209 02
Paid-up and prepaid shares, capital	49,783 44
Paid-up and prepaid shares, dividends	8,702 98
Investment certificates, principal	196,930 88
Investment certificates, dividends	9,828 37
Advance payments	149 00
Reserve and undivided profits	29,852 58
Loans due and incomplete	9,717 12
Sundry ledger accounts	779 20
Total liabilities	$553,601 91

Receipts for Fiscal Year.	
Balance from last report	$33,347 37
Installment shares, dues	49,171 57
Paid-up and prepaid shares, dues	22,621 25
Investment certificates	62,391 99
Interest	36,156 12
Fees	231 50
Loans repaid	248,849 92
Overdrafts and bills payable	15,000 00
Advances repaid, personal accounts	1,424 28
All other receipts, real estate, etc.	24,966 29
Total receipts	$494,160 29

Disbursements for Fiscal Year.	
Overdrafts and bills payable	$15,000 00
Loans on mortgages and shares	249,646 59
Interest paid	11,534 46
Dues repaid, installment shares	51,336 94
Profits repaid, installment shares	11,828 78
Paid-up and prepaid shares, capital	8,600 00
Paid-up and prepaid shares, dividends	617 87
Investment certificates, principal	47,789 39
Investment certificates, dividends	7,419 32
Advances, personal accounts	1,526 42
Salaries	5,307 00
Taxes	58 05
Other expenses	3,747 41
All other disbursements, real estate, bonds, etc.	40,322 93
Balance, cash in office and bank	39,425 13
Total disbursements	$494,160 29

Installment Shares, With Age, Value, and Withdrawal Value.

Dayton plan.
Dues, $1.00 per share per month.
Dividend, last fiscal year, 6 per cent.
Book value, dues plus dividend.
Withdrawal value, full book value.

No. 26. OAKLAND.

COSMOPOLITAN MUTUAL BUILDING AND LOAN ASSOCIATION.

(Incorporated August 4, 1879.)

W. S. GOULD, Secretary. WM. HOFFSCHNEIDER, President.

Fiscal year ended July 31, 1916.

No. of series, 23. No. of members and investors, 282. No. of shares, 2,424.

Assets.		
Loans, on definite contract, $147,891.14; on shares, $4,693.75; on contract sales, $2,486.52		$155,071 41
Arrearages—		
On shares	$1,379 15	
On interest	1,071 68	
		2,450 83
Cash, in office, $1,343.29; in bank, $2,417.66		3,760 95
Real estate owned		9,749 96
Furniture and fixtures		500 00
Advances, ledger accounts		201 41
Total assets		$171,734 56

Liabilities.	
Installment shares, dues	$78,671 80
Installment shares, profits	17,048 15
Paid-up and prepaid shares, capital	20,372 39
Investment certificates, principal	18,646 67
Advance payments	22 68
Overdrafts and bills payable	23,500 00
Reserve and undivided profits	3,870 50
Loans due and incomplete	9,215 02
Sundry ledger accounts	387 35
Total liabilities	$171,734 56

Receipts for Fiscal Year.	
Balance from last report	$3,207 04
Installment shares, dues	25,035 86
Paid-up and prepaid shares, dues	4,050 00
Investment certificates	7,515 00
Interest	11,694 57
Fines	49 42
Loans repaid	70,605 84
Overdrafts and bills payable	40,500 00
Advances repaid, personal accounts	1,399 02
All other receipts	876 90
Total receipts	$164,933 65

Disbursements for Fiscal Year.	
Overdrafts and bills payable	$31,000 00
Loans on mortgages and shares	75,123 15
Interest paid	3,331 17
Dues repaid, installment shares	30,680 93
Profits repaid, installment shares	4,627 29
Paid-up and prepaid shares, capital	1,700 00
Investment certificates, principal	5,960 00
Advances, personal accounts	1,289 16
Salaries	2,522 50
Taxes	966 90
Other expenses	1,052 59
All other disbursements, real estate, etc.	2,919 01
Balance, cash in office and bank	3,760 95
Total disbursements	$164,933 65

Installment Shares, With Age, Value, and Withdrawal Value.

Serial No.	Age in months	Total dues per share	Book value per share	Withdrawal value
56	120	$120 00	$161 57	$159 49
58	108	108 00	140 89	137 60
60	96	96 00	121 41	116 32
62	84	84 00	102 93	97 25
64	72	72 00	85 51	80 10
66	60	60 00	69 09	67 50
68	48	48 00	53 62	52 80
70	36	36 00	39 13	30 76
72	24	24 00	25 42	25 20
74	12	12 00	12 38	12 30

No. 27. ONTARIO.

PEOPLES MUTUAL BUILDING AND LOAN ASSOCIATION.

(Incorporated June 24, 1891.)

J. O. HENDERSON, Secretary. A. P. HARWOOD, President.

Fiscal year ended December 31, 1916.

No. of series, none. No. of members and investors, 700. No. of shares, 13,925.

Assets.		
Loans, on mortgages, $542,850; on shares, $7,090		$549,940 00
Arrearages—		
On interest	$4,804 59	
On fines and fees	629 15	
		5,433 74
Cash, in office, $902.03; in bank, $12,768.08		13,670 11
Real estate owned (office building, $5,729.42)		7,529 42
Furniture and fixtures		1,049 20
Advances, ledger accounts		608 73
Total assets		$578,231 20

Liabilities.	
Installment shares, dues	$205,996 66
Installment shares, profits	57,993 72
Paid-up and prepaid shares, capital	266,050 00
Paid-up and prepaid shares, dividends	7,511 98
Overdrafts and bills payable	18,680 35
Reserve and undivided profits	14,792 96
Loans due and incomplete	6,761 38
Sundry ledger accounts	444 15
Total liabilities	$578,231 20

Receipts for Fiscal Year.	
Balance from last report	$10,843 47
Installment shares, dues	76,243 28
Paid-up and prepaid shares, dues	114,050 00
Interest	37,827 52
Fines	601 95
Fees	40 50
Loans repaid	122,607 64
Overdrafts and bills payable	11,786 46
Advances repaid, personal accounts	8,606 56
All other receipts, furniture and fixtures	170 00
Total receipts	$382,777 38

Disbursements for Fiscal Year.	
Overdrafts and bills payable	$46,343 57
Loans on mortgages and shares	162,614 61
Dues repaid, installment shares	70,483 17
Profits repaid, installment shares	11,308 22
Paid-up and prepaid shares, capital	46,225 00
Paid-up and prepaid shares, dividends	12,208 65
Advances, personal accounts	8,747 34
Salaries	3,061 00
Taxes	470 87
Other expenses	1,196 22
All other disbursements, office building and fixtures	6,448 62
Balance, cash in office and bank	13,670 11
Total disbursements	$382,777 38

Installment Shares, With Age, Value, and Withdrawal Value.

Dayton plan.
Dues 60 cents per share per month.
Dividend, last fiscal year, 7.25 per cent.
Book value, dues plus dividend.
Withdrawal value, dues plus profits as per by-laws.

No. 28. ORANGE.

ORANGE BUILDING AND LOAN ASSOCIATION.

(Incorporated September 21, 1887.)

U. D. RHODES, Secretary. D. C. PIXLEY, President.

Fiscal year ended October 31, 1916.

No. of series, 21. No. of members and investors, 636. No. of shares, 5,783.

Assets.		
Loans on mortgages, $492,800; on definite contract, $74,163.63; on shares, $3,660; on contract sales, $6,224.10		$576,847 73
Arrearages—		
On shares	$1,786 00	
On interest	4,527 02	
On fines	630 95	
		6,943 97
Cash, in office, $136.72; in bank, $17,682.53		17,819 25
Real estate owned		5,462 55
Furniture and fixtures		500 00
Advances, ledger accounts		264 65
Total assets		$607,838 15

Liabilities.	
Guarantee stock, capital	$25,000 00
Guarantee stock, surplus	9,000 00
Installment shares, dues	222,393 00
Installment shares, profits	71,287 97
Paid-up and prepaid shares, capital	249,450 00
Paid-up and prepaid shares, dividends	4,917 16
Advance payments	449 90
Overdrafts and bills payable	10,000 00
Reserve and undivided profits	11,435 60
Loans due and incomplete	1,264 88
Sundry ledger accounts	54 00
All other liabilities, G. C. stock, dividends, etc.	2,585 64
Total liabilities	$607,838 15

Receipts for Fiscal Year.	
Balance from last report	$20,438 40
Installment shares, dues	53,872 25
Paid-up and prepaid shares, dues	89,900 00
Interest	43,294 51
Fines	1,150 16
Fees	433 35
Loans repaid	106,760 20
Overdrafts and bills payable	10,000 00
Advances repaid, personal accounts	1,423 85
All other receipts, real estate	1,039 83
Total receipts	$328,312 55

Disbursements for Fiscal Year.	
Overdrafts and bills payable	10,000 00
Loans on mortgages and shares	207,263 89
Interest paid	13 25
Dividends on guarantee stock	3,500 00
Dues repaid, installment shares	29,134 75
Profits repaid, installment shares	9,930 17
Paid-up and prepaid shares, capital	27,100 00
Paid-up and prepaid shares, dividends	12,112 45
Advances, personal accounts	1,538 06
Salaries	2,345 00
Taxes	639 58
Other expenses	743 66
All other disbursements, real estate, etc.	6,172 49
Balance, cash in office and bank	17,819 25
Total disbursements	$328,312 55

Installment Shares, With Age, Value, and Withdrawal Value.

Serial No.	Age in months	Total dues per share	Book value per share	Withdrawal value
14	120	$120 00	$186 16	$186 16
16	108	108 00	160 01	160 01
18	96	96 00	135 91	135 91
20	84	84 00	113 69	113 69
22	72	72 00	93 25	87 94
24	60	60 00	74 38	70 78
26	48	48 00	56 99	54 74
28	36	36 00	40 94	39 70
30	24	24 00	26 17	25 08
32	12	12 00	12 55	12 27

No. 29. PALO ALTO.

PALO ALTO MUTUAL BUILDING AND LOAN ASSOCIATION.

(Incorporated November 14, 1892.)

EDWARD JESURUN, Secretary. A. B. CLARK, President.

Fiscal year ended September 30, 1916.

No. of series, none. No. of members and investors, 471. No. of shares, 2,304.

Assets.	
Loans, on definite contract, $450,684.87; on shares, $3,425	$454,109 87
Arrearages, on interest	4,498 95
Cash, in office, $200; in bank, $8,022.90	8,222 90
Real estate owned	47,641 48
Furniture and fixtures	2,010 00
Advances, ledger accounts	4,536 88
Other assets, street bonds, etc.	1,764 85
Total assets	$522,784 93

Liabilities.	
Guarantee stock, capital	$31,350 00
Guarantee stock, surplus and unpaid dividend	1,930 75
Installment shares, dues	69,174 25
Installment shares, profits	23,809 66
Paid-up and prepaid shares, capital	36,023 86
Paid-up and prepaid shares, dividends	718 25
Investment certificates, principal	336,918 24
Investment certificates, dividends	1,385 00
Reserve and undivided profits	9,887 27
Loans due and incomplete	7,325 56
All other liabilities, contingent and tax reserve	4,262 09
Total liabilities	$522,784 93

Receipts for Fiscal Year.	
Balance from last report	$3,793 91
Guarantee stock	400 00
Installment shares, dues	18,137 41
Paid-up and prepaid shares, dues	4,676 46
Investment certificates	144,091 98
Interest	45,828 99
Fees	65 25
Loans repaid	115,847 89
Overdrafts and bills payable	5,000 00
Advances repaid, personal accounts	16,449 03
All other receipts	2,172 11
Total receipts	$356,463 03

Disbursements for Fiscal Year.	
Overdrafts and bills payable	$61,500 00
Loans on mortgages and shares	118,050 71
Interest paid	2,335 40
Dividends on guarantee stock	2,816 48
Dues repaid, installment shares	10,443 96
Profits repaid, installment shares	2,336 89
Paid-up and prepaid shares, capital	3,417 18
Paid-up and prepaid shares, dividends	2,309 07
Investment certificates, principal	98,555 68
Investment certificates, dividends	19,062 28
Advances, personal accounts	13,755 97
Salaries	2,820 00
Taxes	2,086 27
Other expenses	1,537 35
All other disbursements, real estate, etc.	7,212 89
Balance, cash in office and bank	8,222 90
Total disbursements	$356,463 03

Installment Shares, With Age, Value, and Withdrawal Value.

Dayton plan.
Dues, $1.00 per share per month.
Dividend, last fiscal year, 7 per cent.
Book value, dues plus dividend.
Withdrawal value, dues plus profits as per by-laws.

No. 30. PASADENA.

CALIFORNIA SECURITY LOAN CORPORATION.

(Incorporated March 22, 1909.)

F. E. WARRINER, Secretary. A. W. BYRNE, President.

Fiscal year ended December 30, 1916.

No. of series, none. No. of members and investors, 981. No. of shares, 1,000.

Assets.

Loans, on mortgages, $177,650; on definite contract, $652,233.68; on shares, $1,100.00; on contract sales, $92,252.92		$923,236 60
Arrearages—		
On interest	$10,137 38	
On fines	111 86	
		10,249 24
Cash, in office, $16,662.99; in bank, $10,130.84		26,793 83
Real estate owned		41,950 37
Furniture and fixtures		850 00
Advances, ledger accounts		496 96
Total assets		$1,003,577 00

Liabilities.

Guarantee stock, capital	$100,000 00
Investment certificates, principal	825,097 51
Investment certificates, dividends	10,316 95
Reserve and undivided profits	3,913 24
Loans due and incomplete	63,950 25
Sundry ledger accounts	299 05
Total liabilities	$1,003,577 00

Receipts for Fiscal Year.

Balance from last report	$845 12
Guarantee stock	75,000 00
Investment certificates	730,393 43
Interest	56,334 12
Premiums	3,818 05
Fines	276 71
Loans repaid	293,445 81
Overdrafts and bills payable	5,000 00
Advances repaid, personal accounts	13,513 12
All other receipts, real estate, etc.	72,964 93
Total receipts	$1,251,591 29

Disbursements for Fiscal Year.

Overdrafts and bills payable	$17,500 00
Loans on mortgages and shares	763,827 36
Interest paid	83 37
Dividends on guarantee stock	20,500 00
Investment certificates, principal	265,213 59
Investment certificates, dividends	38,526 22
Advances, personal accounts	15,150 82
Salaries	8,179 50
Taxes	714 99
Other expenses	6,183 42
All other disbursements, real estate, etc.	88,918 19
Balance, cash in office and bank	26,793 83
Total disbursements	$1,251,591 29

Installment Shares, With Age, Value, and Withdrawal Value.

Dayton plan.
Dues 50 cents per share per month.
Dividend, last fiscal year, 6 per cent.
Book value, dues plus dividend.
Withdrawal value, same as book value.

No. 31. PASADENA.

PASADENA BUILDING AND LOAN ASSOCIATION.

(Incorporated February 6, 1899.)

E. D. HILL, Secretary. SOLON BRIGGS, President.

Fiscal year ended December 31, 1916.

No. of series, none. No. of members and investors, 481. No. of shares, 2,798.

Assets.		Liabilities.	
Loans, on mortgages, $9,800; on definite contract, $98,647.80; on shares, $63,606.28	$172,054 08	Guarantee stock, capital	$9,000 00
Arrearages, on interest	2,949 97	Guarantee stock, surplus	785 83
Cash, in office, $395; in bank, $26,706.01	27,101 01	Installment shares, dues	24,207 75
Advances, ledger accounts	225 18	Installment shares, profits	26,686 37
		Paid-up and prepaid shares, capital	11,300 00
		Paid-up and prepaid shares, dividends	311 00
		Investment certificates, principal	103,007 16
		Investment certificates, dividends	3,398 70
		Reserve and undivided profits	6,040 52
		Loans due and incomplete	17,052 91
		All other liabilities, guaranty dividends unpaid	540 00
Total assets	$202,330 24	Total liabilities	$202,330 24

Receipts for Fiscal Year.		Disbursements for Fiscal Year.	
Balance from last report	$73 25	Loans on mortgages and shares	$70,616 10
Installment shares, dues	24,141 86	Interest paid	122 24
Investment certificates	87,534 58	Dividends on guarantee stock	1,092 00
Interest	12,070 47	Dues repaid, installment shares	12,371 76
Fees	120 00	Profits repaid, installment shares	3,312 21
Loans repaid	36,217 52	Paid-up and prepaid shares, capital	8,550 00
		Paid-up and prepaid shares, dividends	946 00
		Investment certificates, principal	29,744 43
		Investment certificates, dividends	2,687 34
		Salaries	1,898 35
		Taxes	334 41
		Other expenses	1,381 83
		Balance, cash in office and bank	27,101 01
Total receipts	$160,157 68	Total disbursements	$160,157 68

Installment Shares, With Age, Value, and Withdrawal Value.

Dayton plan.
Dues 50 cents per share per month.
Dividend, last fiscal year, 6 per cent.
Book value, dues plus dividend.
Withdrawal value, full book value.

No. 32. PASO ROBLES.

PASO ROBLES MUTUAL BUILDING AND LOAN ASSOCIATION.

(Incorporated September 2, 1905.)

F. G. Wetzel, Secretary. A. Monteith, President.

Fiscal year ended August 31, 1916.

No. of series, 11. No. of members and investors, 72. No. of shares, 371.

Assets.		Liabilities.	
Loans, on mortgages, $1,500; on definite contract, $26,808.17; on shares, $5,105	$33,413 17	Installment shares, dues	$15,019 80
Arrearages, on shares	89 45	Installment shares, profits	5,361 02
Cash in bank	4,557 76	Paid-up and prepaid shares, capital	1,500 00
Furniture and fixtures	156 55	Investment certificates, principal	12,575 00
		Advance payments	22 00
		Reserve and undivided profits	3,400 20
		Sundry ledger accounts	338 91
Total assets	$38,216 93	Total liabilities	$38,216 93

Receipts for Fiscal Year.		Disbursements for Fiscal Year.	
Balance from last report	$3,584 54	Loans on mortgages and shares	$9,536 60
Installment shares, dues	2,777 75	Interest paid	307 41
Investment certificates	6,500 00	Dues repaid, installment shares	6,997 45
Interest	3,364 97	Profits repaid, installment shares	2,146 70
Fines	70 45	Paid-up and prepaid shares, dividends	83 00
Fees	4 45	Investment certificates, principal	1,300 00
Loans repaid	9,357 44	Investment certificates, dividends	393 25
Advances repaid, personal accounts	338 91	Salaries	529 00
		Taxes	99 94
		Other expenses	46 40
		All other disbursements	1 00
		Balance, cash in office and bank	4,557 76
Total receipts	$25,998 51	Total disbursements	$25,998 51

Installment Shares, With Age, Value, and Withdrawal Value.

Serial No.	Age in months	Total dues per share	Book value per share	Withdrawal value
1	132	$132 00	$196 50	$193 27
3	117	117 00	166 55	164 07
4	111	111 00	155 13	152 92
6	105	105 00	144 04	142 08
8	96	96 00	127 86	126 26
10	87	87 00	112 35	109 81
14	69	69 00	83 14	80 31
16	60	60 00	70 75	68 60
18	36	36 00	39 86	38 86
20	12	12 00	12 45	12 33

No. 33. PETALUMA.

PETALUMA MUTUAL LOAN ASSOCIATION.

(Incorporated September 27, 1889.)

F. A. CROMWELL, Secretary. FRANK H. DENMAN, President.

Fiscal year ended September 30, 1916.

No. of series, 12. No. of members and investors, 96. No. of shares, 825.

Assets.		
Loans, on mortgages, $44,467.28; on definite contract, $1,005.00		$45,472 28
Arrearages—		
On shares	$372 00	
On interest	418 60	
On fines	33 85	
		824 45
Cash in bank		3,151 44
Real estate owned		2,370 97
Furniture and fixtures		30 00
Other assets		184 75
Total assets		$52,033 89

Liabilities.	
Installment shares, dues	$42,726 00
Installment shares, profits	8,004 66
Advance payments	8 74
Reserve and undivided profits	1,176 38
Loans due and incomplete	83 36
All other liabilities	34 75
Total liabilities	$52,033 89

Receipts for Fiscal Year.	
Balance from last report	$5,943 31
Installment shares, dues	9,898 00
Interest	2,925 00
Fines	52 65
Loans repaid	8,983 72
Overdrafts and bills payable	3,000 00
All other receipts	50 00
Total receipts	$30,852 68

Disbursements for Fiscal Year.	
Overdrafts and bills payable	$3,000 00
Loans on mortgages and shares	14,857 73
Interest paid	114 33
Dues repaid, installment shares	7,234 00
Profits repaid, installment shares	1,660 63
Advances, personal accounts	34 75
Salaries	420 00
Taxes	81 05
Other expenses	298 75
Balance, cash in office and bank	3,151 44
Total disbursements	$30,852 68

Installment Shares, With Age, Value, and Withdrawal Value.

Serial No.	Age in months	Total dues per share	Book value per share	Withdrawal value
18	132	$132 00	$177 78	$177 78
19	120	120 00	157 10	157 10
20	108	108 00	137 36	137 36
21	96	96 00	118 49	117 93
22	84	84 00	100 68	99 85
23	72	72 00	83 85	82 97
24	60	60 00	67 96	67 16
25	48	48 00	52 90	52 16
26	36	36 00	38 60	38 08
27	24	24 00	25 08	24 81
28	12	12 00	12 25	12 17

No. 34. PLEASANTON.

PLEASANTON MUTUAL BUILDING AND LOAN ASSOCIATION.

(Incorporated March 1, 1895.)

T. H. Silver, Secretary. C. Letham, President.

Fiscal year ended March 28, 1917.

No. of series, 20. No. of members and investors, 50. No. of shares, 296.

Assets.			Liabilities.	
Loans, on mortgages		$22,300 00	Installment shares, dues	$17,298 00
Arrearages—			Installment shares, profits	4,290 35
On shares	$82 00		Reserve and undivided profits	2,094 92
On interest	90 00			
		172 00		
Cash in bank		1,211 27		
Total assets		$23,683 27	Total liabilities	$23,683 27

Receipts for Fiscal Year.		Disbursements for Fiscal Year.	
Balance from last report	$1,351 37	Loans on mortgages and shares	$1,200 00
Installment shares, dues	3,815 00	Dues repaid, installment shares	6,269 00
Interest	1,629 60	Profits repaid, installment shares	1,751 40
Fees	22 50	Salaries	162 80
Loans repaid	4,000 00	Taxes	50 00
		Other expenses	2 00
		All other disbursements	172 00
		Balance, cash in office and bank	1,211 27
Total receipts	$10,818 47	Total disbursements	$10.818 47

Installment Shares, With Age, Value, and Withdrawal Value.

Serial No.	Age in months	Total dues per share	Book value per share	Withdrawal value
24	120	$120 00	$165 80	
28	96	96 00	124 20	Dues plus 90 per cent of profit.
30	84	84 00	105 30	
32	72	72 00	87 30	
34	60	60 00	70 50	
36	48	48 00	54 70	
38	36	36 00	39 70	
40	24	24 00	25 60	
42	12	12 00	12 40	

No. 35. POMONA.

HOME-BUILDERS LOAN ASSOCIATION.

(Incorporated March 16, 1908.)

C. E. Greaser, Secretary. J. W. Fulton, President.

Fiscal year ended March 31, 1917.

No. of series, none. No. of members and investors, 782. No. of shares, 3,349.

Assets.

Loans, on mortgages, etc., $1,040.00; on definite contract, $611,782.98; on shares, $3.960.35	$616.783	33
Cash, in office, $783.85; in bank, $12,347.47	13,131	32
Real estate owned (office building, $15,000)	28,601	46
Furniture and fixtures	735	26
Advances, ledger accounts	1,904	18
Total assets	$661,155	55

Liabilities.

Guarantee stock, capital	$100,000	00
Guarantee stock, surplus and dividends unpaid	18,000	00
Installment shares, dues	55,426	75
Installment shares, profits	19,862	64
Investment certificates, principal	401,881	35
Investment certificates, dividends	6.215	13
Overdrafts and bills payable	45,000	00
Loans due and incomplete	13,947	81
Sundry ledger accounts	487	55
All other liabilities, reserve for interest, etc.	334	32
Total liabilities	$661,155	55

Receipts for Fiscal Year.

Balance from last report	$9.170	29
Installment shares, dues	15,381	25
Investment certificates	297,408	42
Interest	56,500	49
Premiums in expense fund	4,748	05
Fines	436	64
Loans repaid	99,100	44
Overdrafts and bills payable	111,000	00
Advances repaid, personal accounts	8.976	43
All other receipts, rents, etc.	919	28
Total receipts	$603,641	29

Disbursements for Fiscal Year.

Overdrafts and bills payable	$66,000	00
Loans on mortgages and shares	277,432	88
Interest paid	1,065	52
Dividends on guarantee stock	10,000	00
Dues repaid, installment shares	9,748	00
Profits repaid, installment shares	3,035	21
Investment certificates, principal	178,584	29
Investment certificates, dividends	18,297	92
Advances, personal accounts	8,286	81
Salaries	4,300	00
Taxes	749	97
Other expenses	3,779	69
All other disbursements, real estate, etc.	9,229	68
Balance, cash in office and bank	13.131	32
Total disbursements	$603,641	29

Installment Shares, With Age, Value, and Withdrawal Value.

Dayton plan.
Dues $1.00 and 50 cents per share per month.
Dividend, last fiscal year, 10 per cent.
Book value, dues plus dividend.
Withdrawal value, same as book value.

No. 36. POMONA.

MUTUAL BUILDING AND LOAN ASSOCIATION.

(Incorporated December 24, 1892.)

W. D. Frederick, Secretary. Mel Campbell, President.

Fiscal year ended December 30, 1916.

No. of series, 21. No. of members and investors, 1,559. No. of shares, 19,432.

Assets.		
Loans, on mortgages, $997,033.80; on shares, $6,875; on account, $5,000	$1,008,908	80
Arrearages, on shares	3,164	00
Cash, in office, $6,424.24; in bank, $37,655.91	44,080	15
Real estate owned, office building	24,500	00
Furniture and fixtures	1,500	00
Total assets	$1,082,152	95

Liabilities.		
Installment shares, dues	$217,413	00
Installment shares, profits	44,411	13
Paid-up and prepaid shares, capital	782,000	00
Paid-up and prepaid shares, dividends	15,029	85
Advance payments	530	50
Reserve and undivided profits	14,869	97
Sundry ledger accounts	7,898	50
Total liabilities	$1,082,152	95

Receipts for Fiscal Year.		
Balance from last report	$12,254	20
Installment shares, dues	73,035	00
Paid-up and prepaid shares, dues	442,700	00
Interest	67,552	72
Premiums	217	40
Fines	661	53
Fees	750	55
Loans repaid	133,833	70
Advances repaid, personal accounts	3,265	24
All other receipts	3,044	53
Total receipts	$737,314	87

Disbursements for Fiscal Year.		
Loans on mortgages and shares	$371,821	02
Dues repaid, installment shares	46,901	00
Profits repaid, installment shares	12,138	40
Paid-up and prepaid shares, capital	215,600	00
Paid-up and prepaid shares, dividends	37,338	83
Salaries	4,442	00
Taxes	2,352	36
Other expenses	2,163	33
All other disbursements, real estate, etc.	477	78
Balance, cash in office and bank	44,080	15
Total disbursements	$737,314	87

Installment Shares, With Age, Value, and Withdrawal Value.

Serial No.	Age in months	Total dues per share	Book value per share	Withdrawal value
29	120	$60 00	$86 38	$86 38
31	108	54 00	74 82	74 82
33	96	48 00	64 08	62 08
35	84	42 00	54 08	51 87
37	72	36 00	44 68	43 11
39	60	30 00	35 89	34 84
41	48	24 00	27 69	27 04
43	36	18 00	20 03	19 67
45	24	12 00	12 88	12 73
47	12	6 00	6 22	6 18

No. 37. PORTERVILLE.

PORTERVILLE MUTUAL BUILDING AND LOAN ASSOCIATION.

(Incorporated September 27, 1905.)

C. O. PREMO, Secretary. H. C. CARR, President.

Fiscal year ended October 31, 1906.

No. of series, none. No. of members and investors, 151. No. of shares, 2,576.

Assets.		Liabilities.	
Loans, on mortgages, $81,615; on shares, $700	$82,315 00	Installment shares, dues	$58,421 24
Arrearages, on interest	1,469 70	Installment shares, profits	29,516 93
Cash, in office, $784.70; in bank, $7,063.99	7,848 69	Overdrafts and bills payable	1,500 00
Advances, ledger accounts	39 38	Reserve and undivided profits	2,234 60
Total assets	$91,672 77	Total liabilities	$91,672 77

Receipts for Fiscal Year.		Disbursements for Fiscal Year.	
Balance from last report	$3,556 77	Overdrafts and bills payable	$5,600 00
Installment shares, dues	9,618 12	Loans on mortgages and shares	8,650 00
Interest	7,377 78	Interest paid	425 38
Fees	29 85	Dues repaid, installment shares	3,443 26
Loans repaid	5,700 00	Profits repaid, installment shares	911 33
Overdrafts and bills payable	1,500 00	Advances, personal accounts	98 00
Advances repaid, personal accounts	82 00	Salaries	360 00
		Taxes	485 36
		Other expenses	42 50
		Balance, cash in office and bank	7,848 69
Total receipts	$27,864 52	Total disbursements	$27,864 52

Installment Shares, With Age, Value, and Withdrawal Value.

Dayton plan.
Dues 50 cents per share per month.
Dividend, last fiscal year, 8.4 per cent.
Book value, dues plus dividend.
Withdrawal value, full book value.

No. 38. REDLANDS.

HOME INVESTMENT ASSOCIATION.

(Incorporated March 22, 1890.)

J. WARREN SMITH, Secretary. W. T. BILL, President.

Fiscal year ended December 30, 1916.

No. of series, none. No. of members and investors, 1,000. No. of shares, 6,750.

Assets.	
Loans, on mortgages, $5,000; on definite contract, $550,744.79; on shares, $1,125; on contract sales, $4,516.50	$561,386 29
Cash in office, $2,666.60; in bank, $24,230.18	26,896 78
Real estate owned	16,340 82
Furniture and fixtures	1,347 80
Advances, ledger accounts	8,208 28
Total assets	614,179 97

Liabilities.	
Guarantee stock, capital	$100,000 00
Guarantee stock, surplus	20,000 00
Installment shares, dues	38,342 50
Installment shares, profits	9,649 63
Paid-up and prepaid shares, capital	163,396 00
Paid-up and prepaid shares, dividends	5,453 45
Investment certificates, principal	253,450 53
Investment certificates, dividends	6,098 44
Reserve and undivided profits	12,825 38
Loans due and incomplete	3,567 97
Sundry ledger accounts	1,396 07
Total liabilities	$614,179 97

Receipts for Fiscal Year.	
Balance from last report	$15,207 90
Installment shares, dues	18,407 00
Paid-up and prepaid shares, dues	27,600 00
Investment certificates	202,608 03
Interest	53,242 35
Fines	1,246 70
Fees	4,229 00
Loans repaid	177,592 49
Advances repaid, personal accounts	7,488 49
All other receipts, real estate, etc.	4,487 03
Total receipts	$512,108 99

Disbursements for Fiscal Year.	
Loans on mortgages and shares	$190,377 35
Dividends on guarantee stock	12,000 00
Dues repaid, installment shares	9,378 46
Profits repaid, installment shares	1,096 07
Paid-up and prepaid shares, capital	8,600 00
Paid-up and prepaid shares, dividends	10,131 50
Investment certificates, principal	206,921 30
Investment certificates, dividends	13,889 56
Advances, personal accounts	5,390 33
Salaries	3,510 00
Taxes	621 79
Other expenses	7,216 83
All other disbursements, real estate, etc.	16,079 02
Balance, cash in office and bank	26,896 78
Total disbursements	$512,108 99

Installment Shares, With Age, Value, and Withdrawal Value.

Dayton plan.
Dues $1.00 per share per month.
Dividend, last fiscal year, 8 per cent.
Book value, dues plus dividend.
Withdrawal value, full book value.

No. 39. REDWOOD CITY.

SAN MATEO COUNTY BUILDING AND LOAN ASSOCIATION.

(Incorporated May 8, 1890.)

H. W. Schaberg, Secretary. P. P. Chamberlain, President.

Fiscal year ended May 31, 1917.

No. of series, 43. No. of members and investors, 539. No. of shares, 3,677.

Assets.		
Loans, on mortgages, $400; on definite contract, $256,840.11; on shares, $12,570; on contract sales, $2,910.45		$272,720 56
Arrearages—		
On shares	$631 50	
On interest	4,183 81	
		4,815 31
Cash in office, $747.42; in bank, $53,903.92		54,651 34
Real estate owned		43,332 30
Furniture and fixtures		735 00
Advances, ledger accounts		1,662 02
Total assets		$377,916 53

Liabilities.	
Installment shares, dues	$233,795 40
Installment shares, profits	76,210 13
Investment certificates, principal	51,900 00
Advance payments	328 41
Reserve and undivided profits	13,734 71
Loans due and incomplete	1,947 88
Total liabilities	$377,916 53

Receipts for Fiscal Year.	
Balance from last report	$46,342 09
Installment shares, dues	41,561 30
Investment certificates	1,600 00
Interest	27,932 43
Fines	150 92
Fees	93 95
Loans repaid	106,323 91
Advances repaid, personal accounts	2,192 68
All other receipts, rents, etc.	2,541 43
Total receipts	$228,738 71

Disbursements for Fiscal Year.	
Loans on mortgages and shares	$67,595 80
Dues repaid, installment shares	47,197 00
Profits repaid, installment shares	23,639 53
Investment certificates, principal	8,500 00
Investment certificates, dividends	2,752 71
Advances, personal accounts	1,310 75
Salaries	3,151 00
Taxes	1,047 58
Other expenses	826 47
All other disbursements, real estate, etc.	18,066 53
Balance, cash in office and bank	54,651 34
Total disbursements	$228,738 71

Installment Shares, With Age, Value, and Withdrawal Value.

Serial No.	Age in months	Total dues per share	Book value per share	Withdrawal value
59	120	$120 00	$177 07	$168 06
63	108	108 00	151 92	145 59
67	96	96 00	129 28	124 62
71	84	84 00	108 35	105 04
75	72	72 00	89 03	86 86
79	60	60 00	71 11	68 75
83	48	48 00	54 47	53 31
87	36	36 00	39 27	38 40
91	24	24 00	25 24	24 88
95	12	12 00	12 18	12 12

No. 40. RIVERSIDE.

RIVERSIDE COUNTY MUTUAL BUILDING AND LOAN ASSOCIATION.

(Incorporated April 5, 1901.)

M. S. Bowman, Secretary. W. B. Clancy, President.

Fiscal year ended April 30, 1917.

No. of series, none. No. of members and investors, 229. No. of shares, 2,378.

Assets.		Liabilities.	
Loans, on mortgages	$116,800 00	Installment shares, dues	$29,028 47
Cash in bank	18,972 06	Installment shares, profits	9,354 13
Real estate owned	6,161 28	Paid-up and prepaid shares, capital	94,600 00
Advances, ledger accounts	22 43	Paid-up and prepaid shares, dividends	3,311 00
		Reserve and undivided profits	5,662 17
Total assets	$141,955 77	Total liabilities	$141,955 77

Receipts for Fiscal Year.		Disbursements for Fiscal Year.	
Balance from last report	$15,783 21	Loans on mortgages and shares	$12,100 00
Installment shares, dues	14,502 56	Dues repaid, installment shares	21,322 89
Paid-up and prepaid shares, dues	5,700 00	Profits repaid, installment shares	3,563 27
Interest	11,849 04	Paid-up and prepaid shares, capital	11,700 00
Loans repaid	28,200 00	Paid-up and prepaid shares, dividends	3,486 00
		Advances, personal accounts	21 35
		Salaries	1,621 39
		Taxes	205 50
		Other expenses	194 79
		All other disbursements, real estate	2,847 56
		Balance, cash in office and bank	18,972 06
Total receipts	$76,034 81	Total disbursements	$76,034 81

Installment Shares, With Age, Value, and Withdrawal Value.

Dayton plan.
Dues $1.00 per share per month.
Dividend, last fiscal year, 7 per cent.
Book value, dues plus dividend.
Withdrawal value, full book value.

No. 41. SACRAMENTO.

SACRAMENTO BUILDING AND LOAN ASSOCIATION.

(Incorporated August 26, 1874.)

FRANK HICKMAN, Secretary. JOS. H. ARNOLD, President.

Fiscal year ended February 28, 1917.

No. of series, none. No. of members and investors, 466. No. of shares, 5,417.

Assets.	
Loans, on mortgages, $386,116; on contract sales, $1,750	$387,866 00
Arrearages, on interest	1,962 58
Cash in bank	18,521 30
Real estate owned	1,033 16
Furniture and fixtures	315 50
Advances, ledger accounts	350 72
Total assets	$410,049 26

Liabilities.	
Installment shares, dues	$139,880 00
Installment shares, profits	34,429 29
Paid-up and prepaid shares, capital	192,670 00
Paid-up and prepaid shares, dividends	6,100 38
Advance payments	219 80
Reserve and undivided profits	36,749 79
Total liabilities	$410,049 26

Receipts for Fiscal Year.	
Balance from last report	$38,295 61
Installment shares, dues	44,857 00
Paid-up and prepaid shares, dues	30,000 00
Interest	23,584 09
Fees	99 00
Loans repaid	78,304 00
Advances repaid, personal accounts	114 95
All other receipts, real estate	80 67
Total receipts	$215,335 32

Disbursements for Fiscal Year.	
Loans on mortgages and shares	$103,630 00
Dues repaid, installment shares	44,746 73
Profits repaid, installment shares	6,878 43
Paid-up and prepaid shares, capital	25,775 00
Paid-up and prepaid shares, dividends	10,721 89
Advances, personal accounts	206 87
Salaries	2,304 00
Taxes	6 20
Other expenses	1,430 47
All other disbursements, real estate, etc.	1,114 43
Balance, cash in office and bank	18,521 30
Total disbursements	$215,335 32

Installment Shares, With Age, Value, and Withdrawal Value.

Dayton plan.
Dues $1.00 per share per month.
Dividend, last fiscal year, 6 per cent.
Book value, dues plus dividend.
Withdrawal value, full book value.

No. 42. SAN BERNARDINO.

SANTA FE BUILDING AND LOAN ASSOCIATION.

(Incorporated January 8, 1890.)

JOHN FLAGG, Secretary. J. F. PARKER, President.

(Fiscal year ended December 31, 1916.)

No. of series, 11. No. of members and investors, 1,371. No. of shares, 13,461.

Assets.		
Loans, on mortgages, $1,017,195.05; on definite contract, $3,400.00; on shares, $26,471.73; on contract sales, $18,424.34		$1,065,491 12
Arrearages—		
On shares	$4,347 00	
On interest	4,647 75	
On fines	120 70	
		9,115 45
Cash, in office, $4,761.74; in bank, $4,519.27		9,281 01
Real estate owned		19,642 35
Furniture and fixtures		800 00
Total assets		$1,104,329 93

Liabilities.	
Installment shares, dues	$657,337 00
Installment shares, profits	206,283 65
Paid-up and prepaid shares, capital	2,450 00
Investment certificates, principal	215,445 00
Investment certificates, dividends	1,014 00
Reserve and undivided profits	17,086 23
Loans due and incomplete	4,714 05
Total liabilities	$1,104,329 93

Receipts for Fiscal Year.	
Balance from last report	$7,081 07
Installment shares, dues	158,039 00
Investment certificates	27,950 00
Interest	88,974 99
Fines and fees	507 45
Loans repaid	228,917 86
All other receipts, real estate, etc.	7,385 95
Total receipts	$518,856 32

Disbursements for Fiscal Year.	
Loans on mortgages and shares	$222,345 60
Dues repaid, installment shares	112,987 00
Profits repaid, installment shares	54,655 70
Paid-up and prepaid shares, capital	2,500 00
Paid-up and prepaid shares, dividends	127 50
Investment certificates, principal	75,160 00
Investment certificates, dividends	15,874 10
Salaries	3,444 00
Taxes	1,569 28
Other expenses	1,402 00
All other disbursements, real estate	19,510 13
Balance, cash in office and bank	9,281 01
Total disbursements	$518,856 32

Installment Shares, With Age, Value, and Withdrawal Value.

Serial No.	Age in months	Total dues per share	Book value per share	Withdrawal value
27	120	$120 00	$192 32	$192 00
28	108	108 00	164 63	161 80
29	96	96 00	139 87	134 95
30	84	84 00	116 07	109 66
31	72	72 00	94 81	87 96
32	60	60 00	75 34	68 20
33	48	48 00	57 51	52 80
34	36	36 00	41 19	38 59
35	24	24 00	26 23	25 11
36	12	12 00	12 54	12 27

No. 43. SAN DIEGO.

SAN DIEGO BUILDING AND LOAN ASSOCIATION.

(Incorporated July 14, 1885.)

J. R. BEARDSLEY, Secretary. W. R. ROGERS, President.

Fiscal year ended June 30, 1917.

No. of series, 22. No. of members and investors, 443. No. of shares, 3,005.

Assets.		
Loans, on mortgages, $278,950; on shares, $7,560		$286,510 00
Arrearages—		
On shares	$872 00	
On interest	837 25	
		1,709 25
Cash, in office, $2,599.42; in bank, $5,858.26		8,457 68
Real estate owned		1,555 04
Furniture and fixtures		400 00
Total assets		$298,631 97

Liabilities.	
Installment shares, dues	$148,116 00
Installment shares, profits	36,404 32
Investment certificates, principal	93,800 00
Investment certificates, dividends	2,720 85
Advance payments	848 20
Overdrafts and bills payable	6,000 00
Reserve and undivided profits	10,042 60
All other liabilities, tax revenue	700 00
Total liabilities	$298,631 97

Receipts for Fiscal Year.	
Balance from last report	$13,331 72
Installment shares, dues	38,115 00
Investment certificates	10,000 00
Interest	21,151 35
Fines	206 45
Fees	73 10
Loans repaid	69,755 00
Overdrafts and bills payable	6,000 00
Advances repaid, personal accounts	3 00
All other receipts, excise tax refund and rents	482 68
Total receipts	$159,118 30

Disbursements for Fiscal Year.	
Loans on mortgages and shares	71,225 00
Interest paid	23 28
Dues repaid, installment shares	46,098 00
Profits repaid, installment shares	14,987 33
Investment certificates, principal	9,100 00
Investment certificates, dividends	5,686 05
Salaries	1,879 42
Taxes	972 41
Other expenses	414 70
All other disbursements	274 43
Balance, cash in office and bank	8,457 68
Total disbursements	$159,118 30

Installment Shares, With Age, Value, and Withdrawal Value.

Serial No.	Age in months	Total dues per share	Book value per share	Withdrawal value
27	120	$120 00	$169 62	$149 75
29	108	108 00	147 23	132 67
31	96	96 00	126 20	115 00
33	84	84 00	106 48	98 52
35	72	72 00	88 05	83 65
37	60	60 00	70 52	67 37
39	48	48 00	54 72	52 70
41	36	36 00	39 68	38 62
43	24	24 00	25 58	25 15
45	12	12 00	12 37	12 27

No. 44. SAN DIEGO.

SILVER GATE BUILDING AND LOAN ASSOCIATION.

(Incorporated May 22, 1890.)

H. A. CROGHAN, Secretary. M. A. GRAHAM, President.

Fiscal Year ended May 31, 1917.

No. of series, 22. No. of members and investors, 237. No. of shares, 2,960.

Assets.	
Loans, on mortgages, $184,070; on shares, $26,490.80	$210,560 80
Cash, in office, $15,488.15; in bank, $11,116.04	26,604 19
Real estate owned	2,458 90
Total assets	$239,623 89

Liabilities.	
Installment shares, dues	$170,124 00
Installment shares, profits	46,250 72
Investment certificates, principal	21,550 00
Reserve and undivided profits	1,174 17
Loans due and incomplete	525 00
Total liabilities	$239,623 89

Receipts for Fiscal Year.	
Balance from last report	$33,225 89
Installment shares, dues	37,077 00
Interest	16,938 83
Fees	44 50
Loans repaid	68,775 25
All other receipts	847 28
Total receipts	$156,908 75

Disbursements for Fiscal Year.	
Loans on mortgages and shares	$36,009 55
Dues repaid, installment shares	63,321 00
Profits repaid, installment shares	24,202 12
Investment certificates, dividends	1,318 37
Salaries	856 20
Taxes	1,893 26
Other expenses	51 66
All other disbursements, real estate, etc.	2,652 40
Balance, cash in office and bank	26,604 19
Total disbursements	$156,908 75

Installment Shares, With Age, Value, and Withdrawal Value.

Serial No.	Age in months	Total dues per share	Book value per share	Withdrawal value
25	120	$120 00	$167 13	$150 00
27	108	108 00	145 08	132 30
29	96	96 00	124 22	115 20
31	84	84 00	105 25	98 70
33	72	72 00	87 18	82 80
35	60	60 00	70 24	67 50
37	48	48 00	54 40	52 80
39	36	36 00	39 53	38 70
41	24	24 00	25 54	25 20
43	12	12 00	12 39	12 30

No. 45. SAN FRANCISCO.

ARGONAUT MUTUAL BUILDING AND LOAN ASSOCIATION.

(Incorporated January 31, 1891.)

BENJ. M. STICH, Secretary. B. M. GUNZBERGER, President.

Fiscal year ended February 12, 1917.

No. of series, 9. No. of members and investors, 48. No. of shares, 249.

Assets.		
Loans, on mortgages, $26,172.80; on shares, $6,500; on contract sales, $1,027.35		$33,700 15
Arrearages—		
On shares	$1,350 00	
On interest	1,495 75	
On premium	649 30	
		3,495 05
Cash, in office, $78.70; in bank, $2.565.77		2,644 47
Real estate owned		5,032 47
Advances, ledger accounts		1,954 63
Total assets		$46,826 77

Liabilities.	
Installment shares, dues	14.472 00
Installment shares, profits	3.818 79
Overdrafts and bills payable	11.600 00
Reserve and undivided profits	13,320 87
Sundry ledger accounts	320 96
All other liabilities, suspense	3,294 15
Total liabilities	$46,826 77

Receipts for Fiscal Year.	
Balance from last report	$4,914 34
Installment shares, dues	3,816 00
Interest	3,181 90
Premiums	1,111 15
Fees	70
Loans repaid	11,986 00
Overdrafts and bills payable	1,100 00
Advances repaid, personal accounts	1,719 47
All other receipts	69 80
Total receipts	$27,899 36

Disbursements for Fiscal Year.	
Overdrafts and bills payable	$8.500 00
Loans on mortgages and shares	1,622 80
Interest paid	692 83
Dues repaid, installment shares	6,215 00
Profits repaid, installment shares	2,066 64
Advances, personal accounts	1,373 49
Salaries	1,227 50
Taxes	219 02
Other expenses	187 35
All other disbursements	3,150 26
Balance, cash in office and bank	2,644 47
Total disbursements	$27,899 36

Installment Shares, With Age, Value, and Withdrawal Value.

Serial No.	Age in months	Total dues per share	Book value per share	Withdrawal value
17	120	$120 00	$181 53	$166 14
19	96	96 00	132 88	119 97
20	84	84 00	111 25	100 35
21	72	72 00	91 26	82 59
22	60	60 00	72 91	66 45
23	48	48 00	55 93	51 96
24	36	36 00	40 31	38 15
25	24	24 00	25 84	24 92
26	12	12 00	12 45	12 22

No. 46. SAN FRANCISCO.

BAY CITY BUILDING AND LOAN ASSOCIATION.

(Incorporated May 9, 1889.)

B. M. GUNZBURGER, Secretary. BENJ. M. STICH, President.

Fiscal year ended May 28, 1917.

No. of series, 10. No. of members and investors, 69. No. of shares, 326.

Assets.		
Loans, on mortgages, $42,600; on definite contract, $11,900.67; on shares, $1,500		$56,000 67
Arrearages—		
On shares	$830 00	
On interest	818 59	
On premium	367 15	
		2,015 74
Cash, in office, $390.80; in bank, $3,879.52		4,270 32
Advances, ledger accounts		3,043 27
Total assets		$65,330 00

Liabilities.	
Installment shares, dues	$17,232 00
Installment shares, profits	4,555 79
Overdrafts and bills payable	19,087 20
Reserve and undivided profits	24,261 59
Sundry ledger accounts	193 42
Total liabilities	$65,330 00

Receipts for Fiscal Year.	
Balance from last report	$3,822 48
Installment shares, dues	4,587 00
Interest	4,793 57
Premiums	1,579 15
Fees	2 20
Loans repaid	13,948 23
Overdrafts and bills payable	2,000 00
Advances repaid, personal accounts	3,976 32
All other receipts, real estate, etc.	5,913 66
Total receipts	$40,622 61

Disbursements for Fiscal Year.	
Overdrafts and bills payable	$6,742 80
Loans on mortgages and shares	4,500 00
Interest paid	915 20
Dues repaid, installment shares	6,632 00
Profits repaid, installment shares	2,492 65
Advances, personal accounts	4,639 79
Salaries	1,317 50
Taxes	483 95
Other expenses	227 79
All other disbursements, real estate, etc.	8,400 61
Balance, cash in office and bank	4,270 32
Total disbursements	$40,622 61

Installment Shares, With Age, Value, and Withdrawal Value.

Serial No.	Age in months	Total dues per share	Book value per share	Withdrawal value
19	120	$120 00	$185 85	$169 38
20	108	108 00	159 51	144 05
21	96	96 00	135 24	121 50
22	84	84 00	112 86	101 31
23	72	72 00	92 33	84 28
24	60	60 00	73 49	66 74
25	48	48 00	56 22	52 11
26	36	36 00	40 37	38 18
27	24	24 00	25 85	24 92
28	12	12 00	12 45	12 22

No. 47. SAN FRANCISCO.

BAY VIEW BUILDING AND LOAN ASSOCIATION.

(Incorporated November 18, 1911.)

D. A. STEINBAUGH, Secretary. JAS. ALLAN, President.

Fiscal year ended December 30, 1916.

No. of series, none. No. of members and investors, 85. No. of shares, 871.

Assets.		Liabilities.	
Loans, on definite contract, $44,104.92; on shares, $2,600	$46,704 92	Installment shares, dues	$37,416 84
Cash, in office, $1,060.15; in bank, $530.39	1,590 54	Installment shares, profits	4,313 68
Real estate owned	305 45	Overdrafts and bills payable	6,700 00
Advances, ledger accounts	32 09	Reserve and undivided profits	216 58
Other assets	14 10		
Total assets	$48,647 10	Total liabilities	$48,647 10

Receipts for Fiscal Year.		Disbursements for Fiscal Year.	
Balance from last report	$204 60	Overdrafts and bills payable	$3,450 00
Installment shares, dues	23,310 15	Loans on mortgages and shares	31,402 68
Interest	3,535 62	Interest paid	36 83
Fines	20 00	Dues repaid, installment shares	8,511 73
Fees	99 00	Profits repaid, installment shares	81 00
Loans repaid	9,437 34	Advances, personal accounts	736 08
Overdrafts and bills payable	9,550 00	Salaries	893 22
Advances repaid, personal accounts	733 78	Taxes	32 10
		Other expenses	156 31
		Balance, cash in office and bank	1,590 54
Total receipts	$46,890 49	Total disbursements	$46,890 49

Installment Shares, With Age, Value, and Withdrawal Value.

Dayton plan.
Dues $1.00 per share per month.
Dividend, last fiscal year, 7 per cent.
Book value, dues plus dividend.
Withdrawal value, full book value.

No. 48. SAN FRANCISCO.

CALIFORNIA HOME BUILDING-LOAN COMPANY.

(Incorporated July 8, 1889.)

R. L. HANDY, Secretary. P. B. ROBERTS, President.

Fiscal year ended June 30, 1917.

No. of series, none. No. of members and investors, 432. No. of shares, 1,469.

Assets.	
Loans, on definite contract, $563,364.38; on shares, $22,560.32; on contract sales, $49,205.20	$635,129 90
Arrearages, on interest	964 43
Cash, in office, $2,452.62; in bank, $14,430.42	16,883 04
Real estate owned	34,372 74
Furniture and fixtures	1,845 40
Advances, ledger accounts	10,036 05
Other assets, bonds, etc.	1,571 10
Total assets	$700,802 66

Liabilities.	
Guarantee stock, capital	$37,500 00
Guarantee stock, surplus	7,458 80
Installment shares, dues	28,885 80
Installment shares, profits	8,775 85
Paid-up and prepaid shares, capital	32,550 00
Paid-up and prepaid shares, dividends	5,771 32
Investment certificates, principal	431,938 95
Investment certificates, dividends	17,142 06
Overdrafts and bills payable	93,459 26
Reserve and undivided profits	2,443 66
Loans due and incomplete	33,376 96
All other liabilities, dividends unpaid	1,500 00
Total liabilities	$700,802 66

Receipts for Fiscal Year.	
Balance from last report	$23,249 66
Installment shares, dues	4,320 00
Investment certificates	228,196 98
Interest	56,261 83
Premiums	2,002 66
Fines	284 31
Loans repaid	228,057 50
Overdrafts and bills payable	10,566 88
Advances repaid, personal accounts	17,153 65
All other receipts, real estate, etc.	33,756 03
Total receipts	$603,849 50

Disbursements for Fiscal Year.	
Overdrafts and bills payable	$36,850 00
Loans on mortgages and shares	261,938 82
Interest paid	7,037 10
Dividends on guarantee stock	3,750 00
Dues repaid, installment shares	2,412 00
Profits repaid, installment shares	622 75
Paid-up and prepaid shares, capital	18,000 00
Paid-up and prepaid shares, dividends	6,877 51
Investment certificates, principal	161,886 13
Investment certificates, dividends	17,705 47
Advances, personal accounts	16,974 05
Salaries	9,780 00
Taxes	1,423 03
Other expenses	6,118 64
All other disbursements, real estate, etc.	35,590 96
Balance, cash in office and bank	16,883 04
Total disbursements	$603,849 50

Installment Shares, With Age, Value, and Withdrawal Value.

Dayton plan.
Dues 60 cents per share per month.
Dividend, last fiscal year, 7.8 per cent.
Book value, dues plus dividend.
Withdrawal value, dues plus profits as per by-laws.

No. 49. SAN FRANCISCO.

CALIFORNIA MUTUAL SAVINGS FUND LOAN AND BUILDING ASSOCIATION.

(Incorporated March 26, 1887.)

WILLIAM E. BOUTON, Secretary. RICHARD I. WHELAN, President.

Fiscal year ended March 31, 1917.

No. of series, 24. No. of members and investors, 93. No. of shares, 1,118.

Assets.		
Loans, on mortgages, $18,000; on definite contract, $32,571.58; on shares, $5,220; on contract sales, $4,667.53		$60,459 11
Arrearages—		
On shares	$35 00	
On interest	286 40	
		321 40
Cash, in office, $25.26; in bank, $4,568.93		4,594 19
Real estate owned		80 00
Advances, ledger accounts		474 61
Total assets		$65,929 31

Liabilities.	
Installment shares, dues	$40,037 00
Installment shares, profits	6,850 30
Advance payments	163 49
Overdrafts and bills payable	11,100 00
Reserve and undivided profits	7,651 86
All other liabilities	126 66
Total liabilities	$65,929 31

Receipts for Fiscal Year.	
Balance from last report	$677 94
Installment shares, dues	11,605 55
Interest	4,627 27
Fines	19 72
Fees	21 20
Loans repaid	23,956 01
Overdrafts and bills payable	3,550 00
Advances repaid, personal accounts	306 20
All other receipts, real estate, etc.	432 87
Total receipts	$45,196 76

Disbursements for Fiscal Year.	
Overdrafts and bills payable	$5,000 00
Loans on mortgages and shares	25,820 00
Interest paid	728 52
Dues repaid, installment shares	6,856 00
Profits repaid, installment shares	283 88
Advances, personal accounts	490 74
Salaries	1,112 50
Taxes	182 52
Other expenses	128 41
Balance, cash in office and bank	4,594 19
Total disbursements	$45,196 76

Installment Shares, With Age, Value, and Withdrawal Value.

Serial No.	Age in months	Total dues per share	Book value per share	Withdrawal value
40	126	$126 00	$184 00	
42	108	108 00	149 35	Dues plus profits as per by-laws.
46	84	84 00	107 82	
49	72	72 00	88 98	
51	60	60 00	71 37	
55	48	48 00	55 11	
59	36	36 00	40 08	
63	24	24 00	25 90	
67	12	12 00	12 52	

No. 50. SAN FRANCISCO.

CITIZEN'S BUILDING AND LOAN ASSOCIATION.

(Incorporated January 14, 1885.)

FREMONT WOOD, Secretary. THOMAS M. GARDINER, President.

Fiscal year ended February 14, 1917.

No. of series, 45. No. of members and investors, 788. No. of shares, 7,708.

Assets.		
Loans, on mortgages, $87,550; on definite contract, $395,676.75; on shares, $14,650; on contract sales, $15,787.35		$513,664 10
Arrearages—		
On shares	$717 70	
On interest	5,432 31	
On fines	2,126 78	
		8,276 79
Cash in office		1,000 00
Real estate owned		19,554 55
Furniture and fixtures		400 00
Advances, ledger accounts		1,819 33
Other assets		163 32
Total assets		$544,878 09

Liabilities.	
Installment shares, dues	$285,875 50
Installment shares, profits	76,786 24
Advance payments	957 00
Overdrafts and bills payable	141,363 25
Reserve and undivided profits	18,164 39
Loans due and incomplete	21,098 91
Sundry ledger accounts	43 30
All other liabilities, suspense, etc.	589 50
Total liabilities	$544,878 09

Receipts for Fiscal Year.	
Balance from last report	$18,830 03
Installment shares, dues	63,454 93
Interest	34,794 61
Fines	866 88
Fees	484 95
Loans repaid	148,550 84
Overdrafts and bills payable	68,541 97
Advances repaid, personal accounts	1,763 21
All other receipts, real estate, etc.	7,803 10
Total receipts	$345,090 52

Disbursements for Fiscal Year.	
Overdrafts and bills payable	$66,171 17
Loans on mortgages and shares	181,210 53
Interest paid	6,316 13
Dues repaid, installment shares	59,903 40
Profits repaid, installment shares	21,645 00
Advances, personal accounts	1,950 96
Salaries	3,935 70
Taxes	505 39
Other expenses	2,042 75
All other disbursements	409 49
Balance, cash in office and bank	1,000 00
Total disbursements	$345,090 52

Installment Shares, With Age, Value, and Withdrawal Value.

Serial No.	Age in months	Total dues per share	Book value per share	Withdrawal value
88	120	$120 00	$168 45	$166 03
92	108	108 00	146 62	142 96
96	96	96 00	125 84	122 85
100	84	84 00	107 13	103 66
104	72	72 00	89 01	86 46
108	60	60 00	71 84	69 47
112	48	48 00	55 49	54 00
116	36	36 00	40 17	39 34
120	24	24 00	25 84	25 38
124	12	12 00	12 48	12 36

No. 51. SAN FRANCISCO.

EMPIRE BUILDING AND LOAN ASSOCIATION.

(Incorporated August 24, 1889.)

W. E. Bouton, Secretary. Marion Leventritt, President.

Fiscal year ended August 31, 1916.

No. of series, 22. No. of members and investors, 68. No. of shares, 784.

Assets.		
Loans, on mortgages, $52,600; on definite contract, $8,102.79; on shares, $225		$60,927 79
Arrearages—		
On shares	$65 00	
On interest	461 62	
		526 62
Cash, in office, $67.45; in bank, $214.55		282 00
Real estate owned		1,548 98
Advances, ledger accounts		73 76
Total assets		$63,359 15

Liabilities.	
Installment shares, dues	$35,550 00
Installment shares, profits	8,150 54
Advance payments	49 73
Overdrafts and bills payable	12,550 00
Reserve and undivided profits	5,811 38
Loans due and incomplete	1,200 00
All other liabilities, interest on bills payable	47 50
Total liabilities	$63,359 15

Receipts for Fiscal Year.	
Balance from last report	$101 83
Installment shares, dues	7,872 00
Interest	4,772 07
Fines	24 82
Fees	23 00
Loans repaid	12,213 68
Overdrafts and bills payable	11,600 00
Advances repaid, personal accounts	150 84
All other receipts	112 90
Total receipts	$36,871 14

Disbursements for Fiscal Year.	
Overdrafts and bills payable	$8,550 00
Loans on mortgages and shares	14,870 00
Interest paid	836 14
Dues repaid, installment shares	6,817 00
Profits repaid, installment shares	1,628 98
Advances, personal accounts	178 60
Salaries	1,055 00
Taxes	344 93
Other expenses	252 45
All other disbursements, real estate	2,056 04
Balance, cash in office and bank	282 00
Total disbursements	$36,871 14

Installment Shares, With Age, Value, and Withdrawal Value.

Serial No.	Age in months	Total dues per share	Book value per share	Withdrawal value
18	120	$120 00	$163 56	
19	108	108 00	143 31	Dues plus profits as per by-laws.
20	96	96 00	123 93	
21	84	84 00	105 42	
25	69	69 00	83 49	
27	63	63 00	75 09	
32	48	48 00	55 05	
37	33	33 00	36 36	
40	24	24 00	25 80	
44	12	12 00	12 43	

No. 52. SAN FRANCISCO.

EUREKA BUILDING AND LOAN ASSOCIATION.

(Incorporated November 3, 1890.)

WM. E. BOUTON, Secretary. WM. DONALD, President.

Fiscal year ended October 31, 1916.

No. of series, 14. No. of members and investors, 106. No. of shares, 831.

Assets.

Loans, on definite contract, $37,398.07; on shares, $1,500		$38,898 07
Arrearages—		
On shares	$161 10	
On interest	843 19	
		1,004 29
Cash in bank		909 73
Real estate owned		3,752 95
Advances, ledger accounts		148 08
Total assets		$44,713 12

Liabilities.

Installment shares, dues	$26,073 60
Installment shares, profits	5,098 61
Paid-up and prepaid shares, capital	3,000 00
Paid-up and prepaid shares, dividends	90 00
Overdrafts and bills payable	6,300 00
Reserve and undivided profits	2,268 14
Loans due and incomplete	1.050 00
All other liabilities, real estate, suspense, etc.	832 77
Total liabilities	$44,713 12

Receipts for Fiscal Year.

Balance from last report	420 66
Installment shares, dues	7,165 80
Paid-up and prepaid shares, dues	3,000 00
Interest	3,657 90
Fines	198 40
Fees	14 00
Loans repaid	4,955 53
Overdrafts and bills payable	4,700 00
Advances repaid, personal accounts	447 34
All other receipts	29 23
Total receipts	$24,588 86

Disbursements for Fiscal Year.

Overdrafts and bills payable	$6,700 00
Loans on mortgages and shares	6,100 00
Interest paid	429 65
Dues repaid, installment shares	3,912 90
Profits repaid, installment shares	1,481 00
Paid-up and prepaid shares, dividends	45 66
Advances, personal accounts	287 27
Salaries	744 00
Taxes	121 28
Other expenses	104 42
All other disbursements	3,752 95
Balance, cash in office and bank	909 73
Total disbursements	$24,588 86

Installment Shares, With Age, Value, and Withdrawal Value.

Serial No.	Age in months	Total dues per share	Book value per share	Withdrawal value
30	132	$132 00	$179 31	
34	96	96 00	120 04	Dues plus profits as per by-laws.
36	84	84 00	102 02	
38	72	72 00	84 95	
39	60	60 00	68 76	
40	48	48 00	53 44	
42	36	36 00	38 89	
44	24	24 00	25 15	
46	12	12 00	12 26	

No. 53. SAN FRANCISCO.

FIDELITY BUILDING AND LOAN ASSOCIATION.

(Incorporated March 19, 1887.)

WM. E. BOUTON, Secretary. WM. A. BARLAGE, President.

Fiscal year ended March 31, 1917.

No. of series, 36. No. of members and investors, 193. No. of shares, 2,429.

Assets.		
Loans, on mortgages, $85,750; on definite contract, $71,412.60; on shares, $8,246; on contract sales, $11,116.44		$176,525 04
Arrearages—		
On shares	$265 00	
On interest	3,426 58	
		3,691 58
Cash, in office, $94; in bank, $3,895.40		3,989 40
Advances, ledger accounts		602 81
Other assets		1 00
Total assets		$184,809 83

Liabilities.	
Installment shares, dues	$81,090 00
Installment shares, profits	20,848 13
Advance payments	75 00
Overdrafts and bills payable	59,000 00
Reserve and undivided profits	23,116 56
Loans due and incomplete	230 00
All other liabilities	450 14
Total liabilities	$184,809 83

Receipts for Fiscal Year.	
Balance from last report	$1,443 56
Installment shares, dues	20,689 20
Interest	13,161 87
Premiums	90 00
Fines	120 54
Fees	62 80
Loans repaid	58,066 31
Overdrafts and bills payable	32,700 00
Advances repaid, personal accounts	1,367 96
All other receipts	139 50
Total receipts	$127,841 74

Disbursements for Fiscal Year.	
Overdrafts and bills payable	$26,700 00
Loans on mortgages and shares	72,139 54
Interest paid	3,525 12
Dues repaid, installment shares	13,275 00
Profits repaid, installment shares	3,538 26
Advances, personal accounts	1,797 57
Salaries	2,360 00
Taxes	299 85
Other expenses	217 00
Balance, cash in office and bank	3,989 40
Total disbursements	$127,841 74

Installment Shares, With Age, Value, and Withdrawal Value.

Serial No.	Age in months	Total dues per share	Book value per share	Withdrawal value
32	120	$120 00	$183 52	
34	108	108 00	159 50	Dues plus profits as per by-laws.
36	96	96 00	136 74	
39	84	84 00	115 23	
43	72	72 00	95 00	
47	60	60 00	76 01	
51	48	48 00	58 29	
55	36	36 00	41 82	
59	24	24 00	26 62	
63	12	12 00	12 63	

No. 54. SAN FRANCISCO.

FRANKLIN MUTUAL BUILDING AND LOAN ASSOCIATION.

(Incorporated October 23, 1906.)

B. FEDDE, Secretary. OTTO F. E. BURMEISTER, President.

Fiscal year ended December 30, 1916.

No. of series, none. No. of members and investors, 281. No. of shares, 3,655.

Assets.		Liabilities.	
Loans, on mortgages, $50,150; on definite contract, $158,804.06	$208,954 06	Installment shares, dues	$128,192 67
Arrearages, on interest	1,770 27	Installment shares, profits	20,044 60
Cash, in office, $824.33; in bank, $16,317.40	17,141 73	Paid-up and prepaid shares, capital	27,300 00
Furniture and fixtures	1 00	Paid-up and prepaid shares, dividends	691 65
Advances, ledger accounts	134 35	Overdrafts and bills payable	44,000 00
		Reserve and undivided profits	6,889 44
		Loans due and incomplete	350 00
		Sundry ledger accounts	63 50
		All other liabilities, interest on bills payable	469 55
Total assets	$228,001 41	Total liabilities	$228,001 41

Receipts for Fiscal Year.		Disbursements for Fiscal Year.	
Balance from last report	$1,626 15	Overdrafts and bills payable	$10,000 00
Installment shares, dues	44,372 99	Loans on mortgages and shares	61,000 00
Paid-up and prepaid shares, dues	1,500 00	Interest paid	2,666 01
Interest	15,718 35	Dues repaid, installment shares	27,820 37
Fees	344 07	Profits repaid, installment shares	5,438 11
Loans repaid	63,880 56	Paid-up and prepaid shares, capital	1,700 00
Overdrafts and bills payable	4,000 00	Paid-up and prepaid shares, dividends	1,397 62
Advances repaid, personal accounts	751 06	Advances, personal accounts	737 61
All other receipts, rents	120 00	Salaries	2,654 50
		Taxes	318 30
		Other expenses	1,438 93
		Balance, cash in office and bank	17,141 73
Total receipts	$132,313 18	Total disbursements	$132,313 18

Installment Shares, With Age, Value, and Withdrawal Value.

Dayton plan.
Dues $1.00 per share per month.
Dividend, last fiscal year, 5 per cent.
Book value, dues plus dividend.
Withdrawal value, full book value.

No. 55. SAN FRANCISCO.

GLOBE MUTUAL BUILDING AND LOAN ASSOCIATION.

(Incorporated March 30, 1898.)

R. F. CASSIDY, Secretary. FRANK OTIS, President.

Fiscal year ended March 31, 1917.

No. of series, 15. No. of members and investors, 172. No. of shares, 3,354.

Assets.		
Loans, on definite contract, $136,465.29; on shares, $1,000		$137,465 29
Arrearages—		
On shares	$134 40	
On interest	962 07	
		1,096 47
Cash in bank		905 10
Total assets		$139,466 86

Liabilities.	
Installment shares, dues	$29,905 20
Installment shares, profits	7,717 17
Paid-up and prepaid shares, capital	65,200 00
Paid-up and prepaid shares, dividends	2,608 00
Investment certificates, principal	4,500 00
Investment certificates, dividends	42 65
Advance payments	903 50
Overdrafts and bills payable	2,250 00
Reserve and undivided profits	13,349 21
Loans due and incomplete	11,415 50
All other liabilities, tax reserve	1,575 63
Total liabilities	$139,466 86

Receipts for Fiscal Year.	
Balance from last report	$4,078 40
Installment shares, dues	7,576 05
Interest	8,951 15
Fines	108 70
Fees	20 60
Loans repaid	31,182 21
Overdrafts and bills payable	10,750 00
Advances repaid, personal accounts	354 70
All other receipts, real estate	3,087 75
Total receipts	$66,109 56

Disbursements for Fiscal Year.	
Overdrafts and bills payable	$4,000 00
Loans on mortgages and shares	43,569 64
Interest paid	40 97
Dues repaid, installment shares	7,118 00
Profits repaid, installment shares	2,717 80
Paid-up and prepaid shares, capital	5,216 00
Advances, personal accounts	584 94
Salaries	1,417 50
Taxes	63 25
Other expenses	476 36
Balance, cash in office and bank	905 10
Total disbursements	$66,109 56

Installment Shares, With Age, Value, and Withdrawal Value.

Serial No.	Age in months	Total dues per share	Book value per share	Withdrawal value
34	102	$51 00	$72 46	$68 12
37	84	42 00	56 09	52 73
39	72	36 00	46 09	43 33
41	60	30 00	36 83	34 62
43	48	24 00	24 00	27 80
45	36	18 00	20 35	19 54
47	24	12 00	13 03	12 77
49	12	6 00	6 20	6 20

No. 56. SAN FRANCISCO.

HOME MUTUAL DEPOSIT LOAN COMPANY.

(Incorporated November 30, 1885.)

A. R. KNOLL, Secretary. GEO. M. MITCHELL, President.

Fiscal year ended December 31, 1916.

No. of series, none. No. of members and investors, 117. No. of shares, 786.

Assets.	
Loans, on definite contract, $249,329.04; on shares, $100; on contract sales, $2,214.37	$251,643 41
Arrearages, on interest	1,963 15
Cash, in office, $46.77; in bank, $263.82	310 59
Real estate owned	2,224 36
Furniture and fixtures	100 00
Advances, ledger accounts	747 66
Total assets	$256,989 17

Liabilities.	
Guarantee stock, capital	$25,000 00
Guarantee stock, surplus and dividends	3,150 25
Installment shares, dues	27,838 20
Installment shares, profits	9,270 99
Paid-up and prepaid shares, capital	46,825 70
Paid-up and prepaid shares, dividends	1,215 65
Investment certificates, principal	76,759 76
Investment certificates, dividends	3,625 00
Overdrafts and bills payable	38,500 00
Reserve and undivided profits	17,691 44
Loans due and incomplete	4,402 27
All other liabilities, tax reserve, etc.	2,709 91
Total liabilities	$256,989 17

Receipts for Fiscal Year.	
Balance from last report	$782 54
Installment shares, dues	8,744 60
Paid-up and prepaid shares, dues	7,100 00
Investment certificates	46,054 81
Interest	18,503 91
Premiums	567 47
Fines	214 20
Loans repaid	80,635 88
Overdrafts and bills payable	64,600 00
Advances repaid, personal accounts	2,214 40
Total receipts	$229,417 81

Disbursements for Fiscal Year.	
Overdrafts and bills payable	$61,000 00
Loans on mortgages and shares	94,451 50
Interest paid	324 49
Dividends on guarantee stock	3,858 75
Dues repaid, installment shares	5,949 30
Profits repaid, installment shares	2,991 66
Paid-up and prepaid shares, capital	9,500 00
Paid-up and prepaid shares, dividends	2,223 91
Investment certificates, principal	36,372 25
Investment certificates, dividends	2,152 70
Advances, personal accounts	2,812 94
Salaries	3,700 00
Taxes	389 00
Other expenses	1,306 35
All other disbursements, real estate, etc.	2,074 37
Balance, cash in office and bank	310 59
Total disbursements	$229,417 81

Installment Shares, With Age, Value, and Withdrawal Value.

Dayton plan.
Dues $1.00 per share per month.
Dividend, last fiscal year, 6 per cent.
Book value, dues plus dividend.
Withdrawal value, dues plus 95 per cent of profits.

No. 57. SAN FRANCISCO.

MECHANICS BUILDING AND LOAN ASSOCIATION.

(Incorporated January 6, 1891.)

WM. E. BOUTON, Secretary. FREDERICK FILLMORE, President.

Fiscal year ended December 31, 1916.

No. of series, 26. No. of members and investors, 65. No. of shares, 926.

Assets.		
Loans, on mortgages, $76,357.01; on definite contract, $7,835.86; on shares, $1,150		$85,342 87
Arrearages—		
On shares,	$60 00	
On interest	169 32	
		$229 32
Cash in bank		528 58
Advances, ledger accounts		26 00
Total assets		$86,126 77

Liabilities.	
Installment shares, dues	$40,363 00
Installment shares, profits	9,005 13
Paid-up and prepaid shares, capital	2,000 00
Paid-up and prepaid shares, dividends	60 00
Advance payments	33 77
Overdrafts and bills payable	27,500 00
Reserve and undivided profits	6,976 98
All other liabilities, tax reserve, etc.	187 89
Total liabilities	$86,126 77

Receipts for Fiscal Year.	
Balance from last report	$219 33
Installment shares, dues	8,261 00
Paid-up and prepaid shares, dues	2,000 00
Interest	5,947 05
Fines	69 29
Fees	15 90
Loans repaid	6,829 12
Overdrafts and bills payable	6,500 00
Advances repaid, personal accounts	109 91
All other receipts	132 52
Total receipts	$30,084 12

Disbursements for Fiscal Year.	
Overdrafts and bills payable	$8,500 00
Loans on mortgages and shares	9,850 00
Interest paid	1,469 51
Dues repaid, installment shares	6,320 00
Profits repaid, installment shares	1,568 63
Paid-up and prepaid shares, dividends	52 00
Advances, personal accounts	92 41
Salaries	1,167 00
Taxes	350 10
Other expenses	185 89
Balance, cash in office and bank	528 58
Total disbursements	$30,084 12

Installment Shares, With Age, Value, and Withdrawal Value.

Serial No.	Age in months	Total dues per share	Book value per share	Withdrawal value
27	120	$120 00	$166 65	
29	108	108 00	145 56	Dues plus profits as per by-laws.
31	96	96 00	125 45	
33	84	84 00	106 33	
36	72	72 00	88 20	
40	60	60 00	71 05	
44	48	48 00	54 89	
47	39	39 00	43 42	
52	24	24 00	25 50	
56	12	12 00	12 35	

No. 58. SAN FRANCISCO.

OCCIDENTAL LOAN ASSOCIATION.

(Incorporated August 26, 1885.)

BENJ. M. STICH, Secretary. T. I. O'BRIEN, President.

Fiscal year ended September 5, 1916.

No. of series, 10. No. of members and investors, 74. No. of shares, 457.

Assets.

Loans, on mortgages, $57,109.58; on shares, $4,500; on contract sales, $2,393.72		$64,003 30
Arrearages—		
On shares	$1,304 00	
On interest	921 10	
On premium	409 75	
		2,634 85
Cash, in office, $157.55; in bank, $4,487.65		4,645 20
Real estate owned		6,485 16
Advances, ledger accounts		1,093 96
Total assets		$78,862 47

Liabilities.

Installment shares, dues	$25,206 00
Installment shares, profits	7,354 27
Overdrafts and bills payable	22,950 00
Reserve and undivided profits	23,173 88
Sundry ledger accounts	178 32
Total liabilities	$78,862 47

Receipts for Fiscal Year.

Balance from last report	$7,585 15
Installment shares, dues	7,727 00
Interest	5,182 94
Premiums	1,692 30
Fees	2 20
Loans repaid	22,061 64
Advances repaid, personal accounts	549 51
All other receipts, rents	378 50
Total receipts	$45,179 24

Disbursements for Fiscal Year.

Overdrafts and bills payable	$4,500 00
Loans on mortgages and shares	7,895 00
Interest paid	1,015 30
Dues repaid, installment shares	15,613 50
Profits repaid, installment shares	7,213 03
Advances, personal accounts	1,332 58
Salaries	1,662 50
Taxes	663 18
Other expenses	502 75
All other disbursements, refunds	136 20
Balance, cash in office and bank	4,645 20
Total disbursements	$45,179 24

Installment Shares, With Age, Value, and Withdrawal Value.

Serial No.	Age in months	Total dues per share	Book value per share	Withdrawal value
22	120	$120 00	$186 31	$169 73
23	108	108 00	159 37	143 95
24	96	96 00	134 84	121 24
25	84	84 00	112 56	101 13
26	72	72 00	92 20	83 11
27	60	60 00	73 48	66 74
28	48	48 00	56 22	52 10
29	36	36 00	40 37	38 18
30	24	24 00	25 84	24 92
31	12	12 00	12 45	12 22

No. 59. SAN FRANCISCO.

PACIFIC LOAN ASSOCIATION.

(Incorporated December 8, 1884.)

B. M. GUNZBURGER, Secretary. BENJ. M. STICH, President.

Fiscal year ended December 6, 1916.

No. of series, 8. No. of members and investors, 36. No. of shares, 192.

Assets.		
Loans, on mortgages, $16,880; on shares, $100; on contract sales, $7,698.38		$24,678 38
Arrearages—		
On shares	$563 00	
On interest	454 95	
On premium	210 80	
		1,228 75
Cash, in office, $148.70; in bank, $393.56		542 26
Real estate owned		7,697 12
Advances, ledger accounts		2,931 32
Total assets		$37,077 83

Liabilities.	
Installment shares, dues	$12,972 00
Installment shares, profits	3,837 72
Overdrafts and bills payable	11,800 00
Reserve and undivided profits	8,468 11
Total liabilities	$37,077 83

Receipts for Fiscal Year.	
Balance from last report	$992 96
Installment shares, dues	3,162 00
Interest	2,070 10
Premiums	445 70
Fees	2 70
Loans repaid	12,577 20
Overdrafts and bills payable	8,500 00
Advances repaid, personal accounts	1,819 25
Total receipts	$29,569 91

Disbursements for Fiscal Year.	
Overdrafts and bills payable	$3,000 00
Loans on mortgages and shares	4,257 20
Interest paid	438 21
Dues repaid, installment shares	12,579 00
Profits repaid, installment shares	5,415 96
Advances, personal accounts	1,663 39
Salaries	1,210 00
Taxes	192 83
Other expenses	271 06
Balance, cash in office and bank	542 26
Total disbursements	$29,569 91

Installment Shares, With Age, Value, and Withdrawal Value.

Serial No.	Age in months	Total dues per share	Book value per share	Withdrawal value
21	132	$132 00	$188 38	$174 28
22	120	120 00	164 50	153 37
23	108	108 00	142 46	132 12
24	96	96 00	122 12	112 97
28	48	48 00	54 19	51 09
29	36	36 00	39 44	37 72
30	24	24 00	25 52	24 76
31	12	12 00	12 39	12 19

No. 60. SAN FRANCISCO.

PACIFIC STATES SAVINGS AND LOAN COMPANY.

(Incorporated June 14, 1889.)

WM. S. PARDY, Secretary. FERD. REIS, JR., President.

Fiscal year ended December 31, 1916.

No. of series, none. No. of members and investors, 2,178. No. of shares, 4,583.

Assets.		
Loans, on mortgages, $118,752.27; on definite contract, $994,998.32; on shares, $4,560; on bonds, $103,376.61		$1,221,687 20
Arrearages—		
On shares and certs.	$3,430 60	
On interest	3,725 18	
		7,155 78
Cash, in office, $1,669.46; in bank, $88,230.72		89,900 18
Real estate owned		70,300 34
Furniture and fixtures		300 00
Advances, ledger accounts		1,749 18
Total assets		$1,391,092 68

Liabilities.	
Installment shares, dues	$22,758 30
Installment shares, profits	8,878 60
Paid-up and prepaid shares, capital	207,910 00
Paid-up and prepaid shares, dividends	90,894 79
Investment certificates, principal	718,799 22
Investment certificates, dividends	111,680 12
Advance payments	6,238 25
Reserve and undivided profits	162,719 02
Loans due and incomplete	48,855 79
Sundry ledger accounts	5,600 47
All other liabilities, tax reserve	6,758 12
Total liabilities	$1,391,092 68

Receipts for Fiscal Year.	
Balance from last report	$104,782 72
Installment shares, dues	3,356 55
Investment certificates	206,330 86
Interest	109,494 88
Premiums	350 00
Loans repaid	451,660 04
Advances repaid, personal accounts	18,200 28
All other receipts, real estate, etc.	22,758 84
Total receipts	$916,934 17

Disbursements for Fiscal Year.	
Loans on mortgages and shares	$611,323 47
Interest and discount	324 89
Dues repaid, installment shares	21,796 30
Profits repaid, installment shares	8,755 05
Paid-up and prepaid shares, capital	4,320 00
Paid-up and prepaid shares, dividends	17,091 00
Investment certificates, principal	79,315 32
Investment certificates, dividends	15,492 26
Advances, personal accounts	18,066 11
Salaries	16,247 50
Taxes	2,848 26
Other expenses	11,257 07
All other disbursements, real estate, etc.	20,196 76
Balance, cash in office and bank	89,900 18
Total disbursements	$916,934 17

Installment Shares, With Age, Value, and Withdrawal Value.

Serial No.		Age in months	Total dues per share	Book value per share	Withdrawal value
	Certificates—Dues, 60 cents per month	108	$64 80	$89 40	$83 29
		96	57 60	76 63	71 87
		84	50 40	64 64	61 08
		72	43 20	53 43	50 87
		60	36 00	42 95	41 21
		48	28 80	33 16	32 07
		36	21 60	24 01	23 41
		24	14 40	14 46	15 12
		12	7 20	7 47	7 38

Dividend rate 7 per cent.

No. 61. SAN FRANCISCO.

PROGRESS MUTUAL LOAN ASSOCIATION.

(Incorporated December 31, 1894.)

N. STEINBERGER, Secretary. JAMES A. WHITE, President.

Fiscal year ended December 31, 1916.

No. of series, 11. No. of members and investors, 132. No. of shares, 949.

Assets.		
Loans, on definite contract, $49,930.35; on shares, $4,900		$54,830 35
Arrearages—		
On shares	$3 00	
On interest	35 44	
		38 44
Cash in bank		936 55
Real estate owned		1,169 77
Advances, ledger accounts		67 00
Total assets		$57,042 11

Liabilities.	
Installment shares, dues	$43,434 00
Installment shares, profits	11,481 62
Reserve and undivided profits	2,056 49
Loans due and incomplete	70 00
Total liabilities	$57,042 11

Receipts for Fiscal Year.	
Balance from last report	$497 65
Installment shares, dues	7,613 20
Interest	4,865 30
Fines	37 47
Fees	13 90
Loans repaid	27,354 71
Overdrafts and bills payable	10,000 00
Advances repaid, personal accounts	122 60
Total receipts	$50,504 83

Disbursements for Fiscal Year.	
Overdrafts and bills payable	$16,500 00
Loans on mortgages and shares	18,775 00
Interest paid	272 31
Dues repaid, installment shares	5,745 40
Profits repaid, installment shares	1,198 84
Paid-up and prepaid shares, capital	5,000 00
Advances, personal accounts	128 35
Salaries	1,291 00
Taxes	210 86
Other expenses	411 52
All other disbursements	35 00
Balance, cash in office and bank	936 55
Total disbursements	$50,504 83

Installment Shares, With Age, Value, and Withdrawal Value.

Serial No.	Age in months	Total dues per share	Book value per share	Withdrawal value
13	120	$120 00	$162 25	$157 50
14	108	108 00	141 75	137 50
15	96	96 00	122 20	118 00
16	84	84 00	103 57	100 00
17	72	72 00	86 00	83 50
18	60	60 00	69 42	67 50
19	48	48 00	63 87	52 75
20	36	36 00	39 25	38 50
24	24	24 00	25 43	25 00
22	12	12 00	12 36	12 25

No. 62. SAN FRANCISCO.

PROVIDENT MUTUAL LOAN ASSOCIATION.

(Incorporated September 24, 1887.)

N. Steinberger, Secretary. James Rolph, President.

Fiscal year ended September 30, 1916.

No. of series, 11. No. of members and investors, 277. No. of shares, 3,250.

Assets.

Loans, on definite contract, $168,441.16; on shares, $1,325		$169,766 16
Arrearages—		
On shares	$17 70	
On interest	218 55	
		236 25
Cash in bank		12,372 93
Real estate owned		1,401 00
Furniture and fixtures		200 00
Advances, ledger accounts		582 39
Total assets		$184,558 73

Liabilities.

Installment shares, dues	134,562 00
Installment shares, profits	36,059 23
Reserve and undivided profits	6,937 50
Loans due and incomplete	6,900 00
All other liabilities, tax reserve	100 00
Total liabilities	$184,558 73

Receipts for Fiscal Year.

Balance from last report	$1,213 41
Installment shares, dues	27,694 50
Interest	13,968 55
Fines	87 09
Fees	48 90
Loans repaid	52,495 14
Overdrafts and bills payable	32,500 00
Advances repaid, personal accounts	443 25
All other receipts, real estate	200 00
Total receipts	$128,650 84

Disbursements for Fiscal Year.

Overdrafts and bills payable	$40,300 00
Loans on mortgages and shares	44,860 00
Interest paid	385 60
Dues repaid, installment shares	19,510 90
Profits repaid, installment shares	5,390 03
Paid-up and prepaid shares, capital	1,200 00
Advances, personal accounts	800 94
Salaries	2,675 00
Taxes	487 46
Other expenses	667 98
Balance, cash in office and bank	12,372 93
Total disbursements	$128,650 84

Installment Shares, With Age, Value, and Withdrawal Value.

Serial No.	Age in months	Total dues per share	Book value per share	Withdrawal value
22	120	$120 00	$167 94	$165 00
23	108	108 00	146 35	142 00
24	96	96 00	125 91	121 00
25	84	84 00	106 61	101 60
26	72	72 00	88 39	83 75
27	60	60 00	71 25	67 50
28	48.	48 00	55 08	52 80
29	36	36 00	39 92	38 70
30	24	24 00	25 72	25 20
31	12	12 00	12 43	12 25

No. 63. SAN FRANCISCO.

UNION LOAN ASSOCIATION.

(Incorporated May 6, 1881.)

B. M. GUNZBURGER, Secretary. H. DEDERKY, JR., President.

Fiscal year ended May 8, 1917.

No. of series, 10. No. of members and investors, 71. No. of shares, 351.

Assets.		
Loans, on mortgages, $30,000; on contract sales, $5,205.11		$35,205 11
Arrearages—		
On shares	$1,050 00	
On interest	1,152 75	
On premium	569 35	
		2,772 10
Cash in bank		6,022 40
Real estate owned		323 56
Advances, ledger accounts		396 12
Total assets		$44,719 29

Liabilities.	
Installment shares, dues	$14,040 00
Installment shares, profits	3,469 31
Overdrafts and bills payable	14,725 00
Reserve and undivided profits	11,802 87
All other liabilities, suspense	682 11
Total liabilities	$44,719 29

Receipts for Fiscal Year.	
Balance from last report	$1,040 86
Installment shares, dues	3,867 00
Interest	2,454 15
Premiums	720 70
Fees	15 70
Loans repaid	7,096 35
Overdrafts and bills payable	3,500 00
Advances repaid, personal accounts	3,034 51
Total receipts	$21,729 27

Disbursements for Fiscal Year.	
Loans on mortgages and shares	$9,195 52
Interest paid	562 42
Dues repaid, installment shares	2,111 00
Profits repaid, installment shares	925 51
Advances, personal accounts	1,400 10
Salaries	1,305 00
Taxes	151 94
Other expenses	55 38
Balance, cash in office and bank	6,022 40
Total disbursements	$21,729 27

Installment Shares, With Age, Value, and Withdrawal Value.

Serial No.	Age in months	Total dues per share	Book value per share	Withdrawal value
27	120	$120 00	$177 12	$162 84
28	108	108 00	152 35	139 04
29	96	96 00	129 40	117 71
30	84	84 00	108 24	98 54
31	72	72 00	88 83	81 25
32	60	60 00	71 02	65 01
33	48	48 00	54 63	51 31
34	36	36 00	39 50	37 75
35	24	24 00	25 52	24 76
36	12	12 00	12 39	12 19

No. 64. SAN FRANCISCO.

WESTERN LOAN ASSOCIATION.

(Incorporated November 12, 1916.)

BENJ. M. STICH, Secretary. R. M. GUNZBURGER, President

Fiscal year ended November 20, 1916.

No. of series, 10. No. of members and investors, 75. No. of shares, 559.

Assets.			Liabilities.	
Loans, on mortgages, $61,246.25; on shares, $1,000; on contract sales, $4,295.30		$66,541 55	Installment shares, dues	$35,568 00
Arrearages—			Installment shares, profits	11,024 83
On shares	$1,618 00		Overdrafts and bills payable	15,500 00
On interest	1,565 90		Reserve and undivided profits	14,148 40
On premium	628 75		Sundry ledger accounts	72 20
		3,812 65	All other liabilities, tax reserve	74 40
Cash, in office, $496.29; in bank, $1,865.08		2,361 37		
Real estate owned		3,244 04		
Advances, ledger accounts		428 22		
Total assets		$76,387 83	Total liabilities	$76,387 83

Receipts for Fiscal Year.		Disbursements for Fiscal Year.	
Balance from last report	$4,057 41	Loans on mortgages and shares	$25,300 00
Installment shares, dues	7,734 00	Interest paid	771 89
Interest	5,320 18	Dues repaid, installment shares	9,332 00
Premiums	1,406 30	Profits repaid, installment shares	4,224 24
Fees	4 00	Advances, personal accounts	720 25
Loans repaid	22,900 00	Salaries	1,500 00
Overdrafts and bills payable	2,500 00	Taxes	103 94
Advances repaid, personal accounts	840 20	Other expenses	556 43
All other receipts	119 03	All other disbursements	11 00
		Balance, cash in office and bank	2,361 37
Total receipts	$44,881 12	Total disbursements	$44,881 12

Installment Shares, With Age, Value, and Withdrawal Value.

Serial No.	Age in months	Total dues per share	Book value per share	Withdrawal value
21	120	$120 00	$184 28	$164 21
22	108	108 00	157 85	142 89
23	96	96 00	133 45	120 34
24	84	84 00	111 17	100 30
25	72	72 00	90 92	82 40
26	60	60 00	72 46	66 23
27	48	48 00	55 58	51 79
28	36	36 00	40 09	38 04
29	24	24 00	25 76	24 88
30	12	12 00	12 45	12 22

No. 65. SAN JOSE.

MUTUAL BUILDING AND LOAN ASSOCIATION.

(Incorporated March 12, 1889.)

RALPH E. SANDERS, Secretary. CHAS. B. WING, President.

Fiscal year ended December 30, 1916.

No. of series, none. No. of members and investors, 1,142. No. of shares, 4,675.

Assets.		Liabilities.	
Loans, on definite contract, $815,569.77; on shares, $9,300.66; on contract sales, $40,495.99	$865,366 42	Installment shares, dues	$378,727 80
Cash in office, $75; in bank, $9,138.21	9,213 21	Installment shares, profits	81,351 56
Real estate owned	13,793 69	Paid-up and prepaid shares, capital	338,235 00
Furniture and fixtures	2,821 33	Paid-up and prepaid shares, dividends	18,431 41
		Investment notes, principal	36,019 00
		Reserve and undivided profits	21,157 27
		Loans due and incomplete	17,017 10
		Sundry ledger accounts	255 51
Total assets	$891,194 65	Total liabilities	$891,194 65

Receipts for Fiscal Year.		Disbursements for Fiscal Year.	
Balance from last report	$3,897 58	Overdrafts and bills payable	$75,500 00
Installment shares, dues	143,391 10	Loans on mortgages and shares	240,706 22
Paid-up and prepaid shares, dues	90,800 00	Interest paid	249 24
Investment notes	44,994 00	Dues repaid, installment shares	143,204 77
Interest	56,536 02	Profits repaid, installment shares	12,143 85
Loans repaid	164,378 66	Paid-up and prepaid shares, capital	65,950 00
Overdrafts and bills payable	75,500 00	Paid-up and prepaid shares, dividends	19,163 60
Advances repaid, personal accounts	2,916 44	Investment notes, principal	8,975 00
All other receipts, real estate, etc.	7,695 50	Salaries	6,604 16
Total receipts	$590,109 30	Taxes	1,327 37
		Other expenses	4,271 82
		All other disbursements	2,800 06
		Balance, cash in office and bank	9,213 21
		Total disbursements	$590,109 30

Installment Shares, With Age, Value, and Withdrawal Value.

Dayton plan.
Dues $1.00 per share per month.
Dividend, last fiscal year, 6 per cent.
Book value, dues plus dividend.
Withdrawal value, full book value.

No. 66. SAN JOSE.

NUCLEUS BUILDING AND LOAN ASSOCIATION.

(Incorporated March 28, 1889.)

C. H. JOHNSON, Secretary. GEO. B. MCKEE, President.

Fiscal year ended April 5, 1917.

No. of series, none. No. of members and investors, 249. No. of shares, 4,436.

Assets.		Liabilities.	
Loans, on mortgages	$232,760 35	Installment shares, dues	$185,199 36
Arrearages, on interest	1,344 40	Installment shares, profits	31,699 58
Cash in office, $890.60; in bank, $13,283.04	14,173 64	Paid-up and prepaid shares, capital	27,800 00
Real estate owned	3,624 29	Paid-up and prepaid shares, dividends	695 00
Furniture and fixtures	350 00	Reserve and undivided profits	5,401 24
		Loans due and incomplete	1,457 50
Total assets	$252,252 68	Total liabilities	$252,252 68

Receipts for Fiscal Year.		Disbursements for Fiscal Year.	
Balance from last report	$8,244 45	Loans on mortgages and shares	$56,378 23
Installment shares, dues	47,846 60	Dues repaid, installment shares	51,298 32
Interest	17,114 96	Profits repaid, installment shares	7,358 49
Loans repaid	63,897 39	Paid-up and prepaid shares, dividends	1,390 00
All other receipts	3 65	Salaries	2,050 50
		Taxes	440 31
		Other expenses	393 27
		All other disbursements, real estate	3,624 29
		Balance, cash in office and bank	14,173 64
Total receipts	$137,107 05	Total disbursements	$137,107 05

Installment Shares, With Age, Value, and Withdrawal Value.

Dayton plan.
Dues $1.00 per share per month.
Dividend, last fiscal year, 6 per cent.
Book value, dues plus dividend.
Withdrawal value, full book value.

No. 67. SAN JOSE.

SAN JOSE BUILDING AND LOAN ASSOCIATION.

(Incorporated January 30, 1885.)

W. M. SONTHEIMER, Secretary. V. KOCH, President.

Fiscal year ended December 31, 1916.

No. of series, none. No. of members and investors, 785. No. of shares, 14,465.

Assets.		
Loans, on mortgages, $534,565; on contract sales, $541.95		$535,106 95
Arrearages—		
On interest	$4,266 41	
On fines	200 95	
		4,467 36
Cash, in office, $704.98; in bank, $4,073.94		4,778 92
Real estate owned, office building		17,703 42
Furniture and fixtures		688 30
Advances, ledger accounts		1,116 77
Total assets		$563,861 72

Liabilities.	
Installment shares, dues	$443,639 43
Installment shares, profits	47,242 86
Paid-up and prepaid shares, capital	4,000 00
Investment certificates, principal	45,687 00
Investment certificates, dividends	799 47
Reserve and undivided profits	13,066 42
Loans due and incomplete	9,062 20
Sundry ledger accounts	364 34
Total liabilities	$563,861 72

Receipts for Fiscal Year.	
Balance from last report	$5,514 42
Installment shares, dues	265,152 10
Investment certificates	22,112 00
Interest	33,476 82
Fines	282 45
Loans repaid	81,644 62
Overdrafts and bills payable	20,000 00
Advances repaid, personal accounts	3,930 10
All other receipts, rents	1,035 00
Total receipts	$433,147 51

Disbursements for Fiscal Year.	
Overdrafts and bills payable	$35,000 00
Loans on mortgages and shares	229,198 22
Interest paid	246 76
Dues repaid, installment shares	124,562 30
Profits repaid, installment shares	10,317 35
Paid-up and prepaid shares, capital	600 00
Paid-up and prepaid shares, dividends	505 00
Investment certificates, principal	14,500 00
Investment certificates, dividends	1,658 06
Advances, personal accounts	4,505 79
Salaries	3,460 00
Taxes	349 57
Other expenses	1,755 55
All other disbursements	1,709 99
Balance, cash in office and bank	4,778 92
Total disbursements	$433,147 51

Installment Shares, With Age, Value, and Withdrawal Value.

Dayton plan.
Dues 50 cents per share per month.
Dividend, last fiscal year, 6 per cent.
Book value, dues plus dividend.
Withdrawal value, full book value.

No. 68. SAN LUIS OBISPO.

SAN LUIS BUILDING AND LOAN ASSOCIATION.

(Incorporated March 1, 1888.)

M. LEWIN, Secretary. BENJ. BROOKS, President.

Fiscal year ended March 1, 1917.

No. of series, 15. No. of members and investors, 293. No. of shares, 2,704.

Assets.		
Loans, on mortgages, $161,205; on shares, $390		$161,595 00
Arrearages—		
On shares	$112 00	
On interest	161 73	
On fines	51 69	
		325 42
Real estate owned		1,326 14
Advances, ledger accounts		309 00
Total assets		$163,555 56

Liabilities.	
Installment shares, dues	$124,926 00
Installment shares, profits	26,996 63
Paid-up and prepaid shares, capital	800 00
Paid-up and prepaid shares, dividends	30 00
Advance payments	5,304 60
Overdrafts and bills payable	99 15
Reserve and undivided profits	4,000 18
Loans due and incomplete	990 00
All other liabilities, tax reserve	409 00
Total liabilities	$163,555 56

Receipts for Fiscal Year.	
Balance from last report	$1,087 39
Installment shares, dues	27,368 00
Paid-up and prepaid shares, dues	800 00
Interest	13,275 32
Fines	236 37
Fees	66 75
Loans repaid	28,895 00
Overdrafts and bills payable	99 15
Advances repaid, personal accounts	233 61
All other receipts, real estate, etc.	1,402 64
Total receipts	$73,464 23

Disbursements for Fiscal Year.	
Overdrafts and bills payable	$5,500 00
Loans on mortgages and shares	45,080 00
Interest paid	1,390 01
Dues repaid, installment shares	14,048 00
Profits repaid, installment shares	2,668 99
Advances, personal accounts	488 40
Salaries	1,549 42
Taxes	1,152 64
Other expenses	260 63
All other disbursements, real estate, etc.	1,326 14
Total disbursements	$73,464 23

Installment Shares, With Age, Value, and Withdrawal Value.

Serial No.	Age in months	Total dues per share	Book value per share	Withdrawal value
18	120	$120 00	$168 15	$165 74
19	108	108 00	145 96	141 22
20	96	96 00	125 75	119 80
21	84	84 00	106 31	100 18
22	72	72 00	88 00	82 40
23	60	60 00	70 99	66 32
25	48	48 00	54 99	51 50
27	36	36 00	39 98	37 99
29	24	24 00	25 77	24 89
31	12	12 00	12 44	12 22

No. 69. SAN MATEO.

SAN MATEO MUTUAL BUILDING AND LOAN ASSOCIATION.

(Incorporated June 2, 1896.)

C. H. KIRKBRIDE, Secretary. WM. F. TURNBULL, President.

Fiscal year ended December 31, 1916.

No. of series, 41. No. of members and investors, 147. No. of shares, 1,364.

Assets.

Loans, on mortgages, $102,275; on shares, $620		$102,895 00
Arrearages—		
On shares	$1,060 00	
On interest	1,093 44	
On fines	94 00	
		2,247 44
Cash in bank		2,874 82
Real estate owned		8,245 41
Furniture and fixtures		90 00
Advances, ledger accounts		943 27
Other assets		74 79
Total assets		$117,370 73

Liabilities.

Installment shares, dues	$60,087 00
Installment shares, profits	15,406 95
Paid-up and prepaid shares, capital	26,200 00
Paid-up and prepaid shares, dividends	759 50
Advance payments	504 05
Overdrafts and bills payable	6,175 00
Reserve and undivided profits	5,733 30
Loans due and incomplete	2,236 30
Sundry ledger accounts	102 90
All other liabilities, interest, bills payable	165 73
Total liabilities	$117,370 73

Receipts for Fiscal Year.

Balance from last report	$3,492 97
Installment shares, dues	15,345 00
Paid-up and prepaid shares, dues	400 00
Interest	8,291 74
Premiums	206 30
Fines	191 18
Fees	54 60
Loans repaid	27,005 00
Overdrafts and bills payable	5,450 00
Advances repaid, personal accounts	405 59
All other receipts, real estate, etc.	3,456 81
Total receipts	$64,299 19

Disbursements for Fiscal Year.

Overdrafts and bills payable	$8,100 00
Loans on mortgages and shares	23,134 16
Interest paid	631 50
Dues repaid, installment shares	14,565 00
Profits repaid, installment shares	4,078 34
Paid-up and prepaid shares, capital	4,400 00
Paid-up and prepaid shares, dividends	1,784 10
Advances, personal accounts	352 43
Salaries	1,364 50
Taxes	313 20
Other expenses	582 03
All other disbursements, real estate, etc.	2,119 11
Balance, cash in office and bank	2,874 82
Total disbursements	$64,299 19

Installment Shares, With Age, Value, and Withdrawal Value.

Serial No.	Age in months	Total dues per share	Book value per share	Withdrawal value
43	120	$120 00	$171 62	$168 19
47	108	108 00	148 98	146 00
51	96	96 00	127 75	125 50
55	84	84 00	107 79	105 63
59	72	72 00	89 09	87 31
63	60	60 00	71 63	70 20
67	48	48 00	55 30	54 19
71	36	36 00	40 09	39 29
75	24	24 00	25 78	25 26
79	12	12 00	12 46	12 21

No. 70. SAN RAFAEL.

MARIN COUNTY BUILDING AND LOAN ASSOCIATION.

(Incorporated July 19, 1886.)

L. A. LANCEL, Secretary. GEO. M. DODGE, President.

Fiscal year ended July 31, 1916.

No. of series, 19. No. of members and investors, 251. No. of shares, 3,164.

Assets.		
Loans, on mortgages		$158,525 48
Arrearages—		
On shares	$232 00	
On interest	346 35	
On fines	28 85	
		607 20
Cash in bank		1,068 00
Real estate owned		4,989 34
Advances, ledger accounts		500 23
Total assets		$165,690 25

Liabilities.	
Installment shares, dues	$115,056 00
Installment shares, profits	31,131 34
Investment certificates, principal	10,100 00
Investment certificates, dividends	60 29
Advance payments	64 15
Overdrafts and bills payable	1,000 00
Reserve and undivided profits	7,478 47
Loans due and incomplete	800 00
Total liabilities	$165,690 25

Receipts for Fiscal Year.	
Installment shares, dues	$39,717 00
Investment certificates	5,000 00
Interest	14,078 60
Fines	129 75
Fees	116 10
Loans repaid	22,274 52
All other receipts, real estate, etc.	483 75
Total receipts	$81,799 72

Disbursements for Fiscal Year.	
Overdrafts and bills payable	$2.490 33
Loans on mortgages and shares	17,800 00
Interest paid	64 35
Dues repaid, installment shares	44,345 00
Profits repaid, installment shares	12,377 68
Investment certificates, principal	500 00
Investment certificates, dividends	268 15
Advances, personal accounts	461 03
Salaries	1,560 00
Taxes	258 24
Other expenses	476 25
All other disbursements, real estate, etc.	130 69
Balance, cash in office and bank	1,068 00
Total disbursements	$81,799 72

Installment Shares, With Age, Value, and Withdrawal Value.

Serial No.	Age in months	Total dues per share	Book value per share	Withdrawal value
27	114	$114 00	$182 92	$179 47
28	108	108 00	168 30	165 28
30	96	96 00	142 08	137 48
32	84	84 00	117 92	111 14
34	72	72 00	96 00	88 80
36	60	60 00	75 98	69 59
38	48	48 00	57 70	52 35
40	36	36 00	41 38	38 69
42	24	24 00	26 30	25 15
44	12	12 00	12 60	12 30

No. 71. SANTA ANA.

HOME MUTUAL BUILDING AND LOAN ASSOCIATION.

(Incorporated April 1, 1893.)

O. M. Robbins, Secretary. Frank Ey, President.

Fiscal year ended December 31, 1916.

No. of series, 22. No. of members and investors, 1,154. No. of shares, 6,086.

Assets.

Loans, on mortgages, $493,540; on shares, $6,345		$499,885 00
Arrearages—		
On shares	$822 00	
On interest	1,085 75	
		1,907 75
Cash in bank		28,953 63
Real estate owned, office building		19,165 27
Furniture and fixtures		1,488 39
Advances, ledger accounts		102 13
Total assets		$551,502 17

Liabilities.

Installment shares, dues	$278,968 50
Installment shares, profits	75,913 88
Investment certificates, principal	176,245 00
Investment certificates, dividends	3,210 00
Advance payments	165 00
Reserve and undivided profits	16,999 79
Total liabilities	$551,502 17

Receipts for Fiscal Year.

Balance from last report	$23,476 61
Installment shares, dues	73,719 50
Investment certificates	69,975 00
Interest	41,293 26
Fines	389 14
Fees	160 65
Loans repaid	137,675 00
Advances repaid, personal accounts	48 80
All other receipts, real estate, etc.	2,624 88
Total receipts	$349,362 84

Disbursements for Fiscal Year.

Loans on mortgages and shares	$103,445 00
Dues repaid, installment shares	69,336 50
Profits repaid, installment shares	23,432 10
Investment certificates, principal	102,550 00
Investment certificates, dividends	12,323 12
Advances, personal accounts	138 93
Salaries	2,795 00
Taxes	958 38
Other expenses	1,578 47
All other disbursements, real estate, etc.	3,851 71
Balance, cash in office and bank	28,953 63
Total disbursements	$349,362 84

Installment Shares, With Age, Value, and Withdrawal Value.

Serial No.	Age in months	Total dues per share	Book value per share	Withdrawal value
20	120	$120 00	$181 58	$181 58
22	108	108 00	156 53	156 53
24	96	96 00	133 24	128 27
26	84	84 00	111 63	105 40
28	72	72 00	91 62	84 37
30	60	60 00	73 23	68 20
32	48	48 00	56 08	52 19
34	36	36 00	40 29	38 14
36	24	24 00	25 88	24 94
38	12	12 00	12 47	12 23

No. 72. SANTA BARBARA.

LOAN AND BUILDING ASSOCIATION.

(Incorporated May 23, 1887.)

LAURA M. BAKER, Secretary pro tem. H. L. STAMBACH, President.

Fiscal year ended June 30, 1917.

No. of series, 23. No. of members and investors, 514. No. of shares, 3,442.

Assets.		
Loans, on mortgages, $397,266; on shares, $2,300		$399,566 00
Arrearages—		
On shares	$2,109 00	
On interest	1,634 81	
On fines	278 25	
		4,022 06
Cash, in office, $53.01; in bank, $8,513.75		8,566 76
Furniture and fixtures		607 65
Advances, ledger accounts		612 44
Total assets		$413,374 91

Liabilities.	
Installment shares, dues	$147,318 00
Installment shares, profits	27,789 30
Investment notes, principal	227,700 00
Investment notes, dividends	1,539 01
Advance payments	20 00
Reserve and undivided profits	5,083 60
Loans due and incomplete	3,800 00
All other liabilities	125 00
Total liabilities	$413,374 91

Receipts for Fiscal Year.	
Balance from last report	$4,597 10
Installment shares, dues	42,833 00
Investment notes	39,200 00
Interest	26,284 18
Fines	245 26
Fees	94 35
Loans repaid	68,604 00
Advances repaid, personal accounts	175 57
Total receipts	$182,033 46

Disbursements for Fiscal Year.	
Loans on mortgages and shares	$106,290 00
Dues repaid, installment shares	35,768 00
Profits repaid, installment shares	8,815 65
Investment notes, principal	6,800 00
Investment notes, dividends	12,509 90
Advances, personal accounts	454 61
Salaries	1,381 00
Taxes	861 65
Other expenses	585 89
Balance, cash in office and bank	8,566 76
Total disbursements	$182,033 46

Installment Shares, With Age, Value, and Withdrawal Value.

Serial No.	Age in months	Total dues per share	Book value per share	Withdrawal value
26	120	$120 00	$161 06	$161 06
28	108	108 00	140 85	104 85
30	96	96 00	121 66	121 66
32	84	84 00	103 14	103 14
34	72	72 00	85 79	85 79
36	60	60 00	69 33	69 33
38	48	48 00	53 77	53 77
40	36	36 00	39 10	39 10
42	24	24 00	25 34	25 34
44	12	12 00	12 36	12 36

No. 73. SANTA BARBARA.

SANTA BARBARA MUTUAL BUILDING AND LOAN ASSOCIATION.

(Incorporated May 20, 1901.)

J. M. WARREN, Secretary. E. C. ROEDER, President.

Fiscal year ended March 1, 1917.

No. of series, none. No. of members and investors, 1,035. No. of shares, 16,126.

Assets.		Liabilities.	
Loans, on mortgages	$621,671 76	Installment shares, dues	$558,595 36
Arrearages, on interest	5,109 72	Installment shares, profits	136,201 99
Cash in bank	75,263 73	Reserve and undivided profits	8,871 34
Real estate owned	9,021 88	Loans due and incomplete	7,398 40
Total assets	$711,067 09	Total liabilities	$711,067 09

Receipts for Fiscal Year.		Disbursements for Fiscal Year.	
Balance from last report	$30,131 25	Loans on mortgages and shares	$250,729 51
Installment shares, dues	216,748 95	Interest rebated	12 49
Interest	44,088 44	Dues repaid, installment shares	146,751 19
Fines	30 96	Profits repaid, installment shares	12,943 14
Loans repaid	199,259 56	Salaries	2,659 85
All other receipts, real estate, etc.	5,550 76	Taxes	1,269 42
		Other expenses	1,207 74
		All other disbursements, real estate, etc.	4,972 85
		Balance, cash in office and bank	75,263 73
Total receipts	$495,809 92	Total disbursements	$495,809 92

Installment Shares, With Age, Value, and Withdrawal Value.

Dayton plan.
Dues 50 cents per share per month.
Dividend, last fiscal year, 6 per cent.
Book value, dues plus dividend.
Withdrawal value, full book value.

No. 74. SANTA CLARA.

SANTA CLARA BUILDING AND LOAN ASSOCIATION.

(Incorporated March 19, 1889.)

F. O. ROLL, Secretary. J. B. O'BRIEN, President.

Fiscal year ended March 31, 1917.

No. of series, 21. No. of members and investors, 312. No. of shares, 2,729.

Assets.		
Loans, on mortgages, $207,150; on shares, $901; on contract sales, $6,690.25		$214,741 25
Arrearages—		
On shares	$2,898 50	
On interest	3,805 70	
On fines	182 70	
		6,886 90
Cash in bank		7,142 64
Real estate owned		18,653 82
Advances, ledger accounts		155 50
Other assets		70 70
Total assets		$247,650 81

Liabilities.	
Installment shares, dues	$160,171 50
Installment shares, profits	50,156 19
Paid-up and prepaid shares, capital	18,200 00
Paid-up and prepaid shares, dividends	182 00
Advance payments	152 50
Reserve and undivided profits	15,563 52
Loans due and incomplete	2,145 10
Sundry ledger accounts	1,080 00
Total liabilities	$247,650 81

Receipts for Fiscal Year.	
Installment shares, dues	$33,891 25
Interest	20,975 64
Fines	184 15
Fees	29 45
Loans repaid	42,034 90
Advances repaid, personal accounts	69 40
All other receipts, rents, etc.	699 11
Total receipts	$97,883 90

Disbursements for Fiscal Year.	
Overdrafts and bills payable	$599 79
Loans on mortgages and shares	25,302 45
Interest paid	14 05
Dues repaid, installment shares	34,767 00
Profits repaid, installment shares	14,409 90
Paid-up and prepaid shares, capital	5,100 00
Paid-up and prepaid shares, dividends	882 15
Advances, personal accounts	120 30
Salaries	1,395 00
Taxes	3,699 48
Other expenses	222 10
All other disbursements	4,229 04
Balance, cash in office and bank	7,142 64
Total disbursements	$97,883 90

Installment Shares, With Age, Value, and Withdrawal Value.

Serial No.	Age in months	Total dues per share	Book value per share	Withdrawal value
21	120	$120 00	$178 38	$178 38
23	108	108 00	153 98	153 98
25	96	96 00	131 34	129 00
27	84	84 00	110 33	108 00
29	72	72 00	90 83	88 00
31	60	60 00	72 73	70 00
33	48	48 00	55 93	52 50
35	36	36 00	40 34	38 00
37	24	24 00	25 87	25 00
39	12	12 00	12 46	12 25

No. 75. SANTA CRUZ.

SANTA CRUZ COUNTY BUILDING AND LOAN ASSOCIATION.

(Incorporated May 20, 1908.)

GEO. W. WOOD, Secretary. GEO. W. STONE, President.

Fiscal year ended April 20, 1917.

No. of series, none. No. of members and investors, 60. No. of shares, 399.

Assets.		Liabilities.	
Loans, on definite contract	$35,030 82	Guarantee stock, capital	$21,700 00
Cash in office, $175.79; in bank, $1,989.48	2.165 27	Guarantee stock, surplus	1,605 77
Real estate owned	916 77	Installment shares, dues	3,965 50
Furniture and fixtures	165 00	Installment shares, profits	1,222 23
		Paid-up and prepaid shares, capital	6,300 00
		Paid-up and prepaid shares, dividends	189 00
		Investment certificates, principal	1,041 02
		Investment certificates, dividends	229 11
		Reserve and undivided profits	487 00
		Sundry ledger accounts	12 11
		All other liabilities, unearned premium	1,526 12
Total assets	$38,277 86	Total liabilities	$38,277 86

Receipts for Fiscal Year.		Disbursements for Fiscal Year.	
Balance from last report	$1,300 50	Overdrafts and bills payable	$4,200 00
Installment shares, dues	640 50	Loans on mortgages and shares	3,883 50
Paid-up and prepaid shares, dues	700 00	Interest paid	78 38
Investment certificates	279 79	Dividends on guarantee stock	1,302 00
Interest	2,512 63	Dues repaid, installment shares	286 50
Premiums	122 50	Profits repaid, installment shares	14 45
Fees	10 00	Paid-up and prepaid shares, capital	2,000 00
Loans repaid	8,187 68	Paid-up and prepaid shares, dividends	445 80
Overdrafts and bills payable	2,600 00	Investment certificates, principal	366 75
All other receipts, suspenses, etc.	80 78	Investment certificates, dividends	8 69
		Salaries	480 00
		Taxes	55 94
		Other expenses	214 55
		All other disbursements, real estate, etc.	932 55
		Balance, cash in office and bank	2,165 27
Total receipts	$16,434 38	Total disbursements	$16,434 38

Installment Shares, With Age, Value, and Withdrawal Value.

Dayton plan.
Dues 50 cents per share per month.
Dividend, last fiscal year, 7 per cent.
Book value, dues plus dividend.
Withdrawal value, dues plus 6 per cent for average time.

No. 76. SANTA PAULA.

SANTA PAULA BUILDING AND LOAN ASSOCIATION.

(Incorporated April 21, 1890.)

H. H. Youngken, Secretary. D. W. Mott, President.

Fiscal year ended May 9, 1917.

No. of series, 19. No. of members and investors, 450. No. of shares, 7,094.

Assets.

Loans, on mortgages, $495,100; on shares, $4,100		$499,200 00
Arrearages—		
On shares	$1,729 30	
On interest	1,418 30	
On premium	11 80	
On fines	155 22	
		3,314 62
Cash in bank		3,228 02
Real estate owned		2,309 20
Furniture and fixtures		1,715 33
Advances, ledger accounts		1,245 77
Other assets		115 47
Total assets		$511,128 41

Liabilities.

Installment shares, dues	$235,068 00
Installment shares, profits	44,790 85
Investment notes, principal	212,375 00
Advance payments	2,323 95
Overdrafts and bills payable	5,000 00
Reserve and undivided profits	9,300 00
Loans due and incomplete	2,270 61
Total liabilities	$511,128 41

Receipts for Fiscal Year.

Balance from last report	$6,226 74
Installment shares, dues	85,862 80
Investment notes	92,650 00
Interest	42,205 44
Premiums	204 45
Fines	336 18
Fees	247 50
Loans repaid	185,100 00
Overdrafts and bills payable	31,000 00
Advances repaid, personal accounts	1,345 52
Total receipts	$445,178 63

Disbursements for Fiscal Year.

Overdrafts and bills payable	$36,000 00
Loans on mortgages and shares	210,388 40
Interest paid	1,123 78
Dues repaid, installment shares	88,272 30
Profits repaid, installment shares	21,746 76
Investment notes, principal	61,200 00
Investment notes, dividends	11,951 30
Advances, personal accounts	2,108 44
Salaries	3,746 12
Taxes	790 88
Other expenses	2,313 43
All other disbursements, real estate	2,309 20
Balance, cash in office and bank	3,228 02
Total disbursements	$445,178 63

Installment Shares, With Age, Value, and Withdrawal Value.

Serial No.	Age in months	Total dues per share	Book value per share	Withdrawal value
19—A	108	$54 00	$78 17	$76 97
20—A	96	48 00	66 58	65 66
22—C	72	72 00	91 84	90 85
23—C	60	60 00	73 42	72 08
24—C	48	48 00	56 40	54 74
25—C	36	36 00	40 64	39 34
26—C	24	24 00	26 04	25 50
27—C	12	12 00	12 52	12 38

No. 77. SANTA ROSA.

SANTA ROSA BUILDING AND LOAN ASSOCIATION.

(Incorporated October 3, 1888.)

C. D. BARNETT, Secretary. ALLEN B. LEMMON, President.

Fiscal year ended October 31, 1916.

No. of series, 11. No. of members and investors, 259. No. of shares, 2,287.

Assets.		
Loans, on definite contract, $132,852.14; on shares, $3,140		$135,992 14
Arrearages—		
On shares	$52 90	
On interest	446 99	
		499 89
Cash in bank		6,761 54
Advances, ledger accounts		88 97
Total assets		$143,342 54

Liabilities.	
Installment shares, dues	$82,758 00
Installment shares, profits	20,309 51
Investment certificates, principal	32,354 05
Advance payments	71 52
Reserve and undivided profits	3,768 66
Loans due and incomplete	4,080 80
Total liabilities	$143,342 54

Receipts for Fiscal Year.	
Balance from last report	$1,155 02
Installment shares, dues	19,378 70
Investment certificates	27,395 31
Interest	9,580 01
Fees	43 00
Loans repaid	43,019 40
Overdrafts and bills payable	1,500 00
Advances repaid, personal accounts	163 53
All other receipts, real estate, etc.	1,030 00
Total receipts	$103,264 97

Disbursements for Fiscal Year.	
Overdrafts and bills payable	$10,500 00
Loans on mortgages and shares	37,359 90
Interest paid	259 02
Dues repaid, installment shares	14,317 00
Profits repaid, installment shares	4,672 13
Investment certificates, principal	25,979 10
Investment certificates, dividends	1,628 09
Advances, personal accounts	237 35
Salaries	1,000 00
Taxes	143 31
Other expenses	305 96
All other disbursements, real estate, etc.	101 57
Balance, cash in office and bank	6,761 54
Total disbursements	$103,264 97

Installment Shares, With Age, Value, and Withdrawal Value.

Serial No.	Age in months	Total dues per share	Book value per share	Withdrawal value
19	120	$120 00	$165 41	$160 59
20	108	108 00	144 50	139 59
21	96	96 00	124 59	120 00
22	84	84 00	105 67	101 64
23	72	72 00	87 71	84 42
24	60	60 00	70 72	68 25
25	48	48 00	54 74	53 04
26	36	36 00	39 74	38 70
27	24	24 00	25 65	25 14
28	12	12 00	12 42	12 30

No. 78. SAUSALITO.

SAUSALITO MUTUAL LOAN ASSOCIATION.

(Incorporated December 1, 1887.)

J. J. Ross, Secretary. C. O. SHARPE, President.

Fiscal year ended October 31, 1916.

No. of series, 7. No. of members and investors, 133. No. of shares, 1,245.

Assets.	
Loans, on mortgages, $33,300; on definite contract, $4,649.75	$37,949 75
Arrearages, on shares	197 00
Cash in bank	5,275 99
Real estate owned	6,424 88
Total assets	$49,847 62

Liabilities.	
Installment shares, dues	$38,910 00
Installment shares, profits	6,474 52
Reserve and undivided profits	4,389 20
Sundry ledger accounts	73 90
Total liabilities	$49,847 62

Receipts for Fiscal Year.	
Balance from last report	$2,823 79
Installment shares, dues	15,227 15
Interest	4,941 07
Premiums	15 00
Fines	81 34
Fees	30 00
Loans repaid	21,711 63
Overdrafts and bills payable	3,500 00
Advances repaid, personal accounts	526 73
All other receipts, real estate, etc.	532 20
Total receipts	$49,388 91

Disbursements for Fiscal Year.	
Overdrafts and bills payable	$3,500 00
Loans on mortgages and shares	10,550 00
Interest paid	67 92
Dues repaid, installment shares	19,082 30
Profits repaid, installment shares	4,157 52
Salaries	540 00
Taxes	122 09
Other expenses	47 71
All other disbursements	6,045 38
Balance, cash in office and bank	5,275 99
Total disbursements	$49,388 91

Installment Shares, With Age, Value, and Withdrawal Value.

Serial No.	Age in months	Total dues per share	Book value per share	Withdrawal value
24	72	$72 00	$91 51	
25	60	60 00	73 23	Dues plus profits as per by-laws.
26	48	48 00	56 39	
27	36	36 00	40 55	
28	24	24 00	25 96	
29	12	12 00	12 48	
30	6	6 00	6 15	

No. 79. STOCKTON.

SAN JOAQUIN VALLEY BUILDING AND LOAN ASSOCIATION.

(Incorporated June 17, 1889.)

A. M. NOBLE, Secretary. S. N. CROSS, President.

Fiscal year ended December 31, 1916.

No. of series, none. No. of members and investors, 1,678. No. of shares, 16,271.

Assets.	
Loans on mortgages	$754,471 51
Arrearages, on interest	4,513 55
Cash in bank	69,408 04
Real estate owned	12,500 04
Advances, ledger accounts	2,777 22
Total assets	$843,670 36

Liabilities.	
Installment shares, dues	$367,936 12
Installment shares, profits	94,371 07
Paid-up and prepaid shares, capital	275,302 07
Paid-up and prepaid shares, dividends	52,603 30
Reserve and undivided profits	33,900 00
Loans due and incomplete	19,557 80
Total liabilities	$843,670 36

Receipts for Fiscal Year.	
Balance from last report	$31,846 22
Installment shares, dues	136,797 78
Paid-up and prepaid shares, dues	78,172 41
Interest	58,352 45
Loans repaid	224,647 25
Advances repaid, personal accounts	15,653 63
All other receipts, real estate, etc.	23,292 11
Total receipts	$568,761 85

Disbursements for Fiscal Year.	
Loans on mortgages and shares	$268,890 82
Interest paid	93 80
Dues repaid, installment shares	111,885 46
Profits repaid, installment shares	18,833 98
Paid-up and prepaid shares, capital	52,264 00
Paid-up and prepaid shares, dividends	10,962 90
Advances, personal accounts	3,570 16
Salaries	6,365 00
Taxes	1,048 78
Other expenses	2,150 45
All other disbursements, real estate, etc.	23,288 46
Balance, cash in office and bank	69,408 04
Total disbursements	$568,761 85

Installment Shares, With Age, Value, and Withdrawal Value.

Dayton plan.
Dues $1.00 per share per month.
Dividend, last fiscal year, 7.20 per cent.
Book value, dues plus dividend.
Withdrawal value, full book value.

No. 80. STOCKTON.

SECURITY BUILDING-LOAN ASSOCIATION.

(Incorporated October 28, 1912.)

F. L. WILLIAMS, Secretary. E. S. VANPELT, President.

Fiscal year ended December 31, 1916.

No. of series, none. No. of members and investors, 393. No. of shares, 250.

Assets.		Liabilities.	
Loans, on definite contract, $172,378.71; on shares, $950; on contract sales, $5,677.80	$179,006 51	Guarantee stock, capital	$25,000 00
Cash, in office, $1,289.25; in bank, $11,361.50	12,650 75	Guarantee stock, surplus	1,945 04
Real estate owned	587 37	Investment certificates, principal	160,764 62
Furniture and fixtures	209 75	Loans due and incomplete	5,357 29
Advances, ledger accounts	620 61	All other liabilities	8 04
Total assets	$193,074 99	Total liabilities	$193,074 99

Receipts for Fiscal Year.		Disbursements for Fiscal Year.	
Balance from last report	$12,490 82	Loans on mortgages and shares	$121,945 33
Investment certificates	107,178 21	Dividends on guarantee stock	2,279 16
Interest	11,446 10	Investment certificates, principal	31,973 98
Fees	284 50	Investment certificates, dividends	3,900 90
Loans repaid	45,794 82	Advances, personal accounts	1,210 14
Advances repaid, personal accounts	781 01	Salaries	2,485 00
All other receipts	487 04	Taxes	146 54
		Other expenses	1,515 45
		All other disbursements, real estate, etc.	355 25
		Balance, cash in office and bank	12,650 75
Total receipts	$178,462 50	Total disbursements	$178,462 50

Installment Shares, With Age, Value, and Withdrawal Value.

Dayton plan.
Dues 50 cents per share per month.
Dividend, last fiscal year, 6 per cent.
Book value, dues plus dividend.
Withdrawal value, full book value.

No. 81. STOCKTON.

STOCKTON LAND LOAN AND BUILDING ASSOCIATION.

(Incorporated January 3, 1887.)

CHAS. E. LITTLEHALE, Secretary. J. D. YOUNG, President.

Fiscal year ended December 31, 1916.

No. of series, none. No. of members and investors, 1,030. No. of shares, 12,236.

Assets.	
Loans, on mortgages, $844,880.47; on shares, $11,600	$856,480 47
Arrearages, on interest	3,588 50
Cash, in office, $4,173.16; in bank, $55,843.29	60,016 45
Real estate owned	2,792 18
Furniture and fixtures	800 00
Advances, ledger accounts	4,078 32
Total assets	$927,755 92

Liabilities.	
Installment shares, dues	$470,884 15
Installment shares, profits	183,838 82
Paid-up and prepaid shares, capital	213,000 00
Paid-up and prepaid shares, dividends	8,611 12
Reserve and undivided profits	44,563 62
Loans due and incomplete	5,758 21
Sundry ledger accounts	1,100 00
Total liabilities	$927,755 92

Receipts for Fiscal Year.	
Balance from last report	$20,687 99
Installment shares, dues	103,276 48
Paid-up and prepaid shares, dues	16,200 00
Interest	68,270 29
Fees	143 50
Loans repaid	209,520 00
Overdrafts and bills payable	5,000 00
Advances repaid, personal accounts	2,231 23
All other receipts	1,371 37
Total receipts	$426,700 86

Disbursements for Fiscal Year.	
Overdrafts and bills payable	$5,000 00
Loans on mortgages and shares	$175,880 81
Interest paid	23 33
Dues repaid, installment shares	77,589 31
Profits repaid, installment shares	30,671 06
Paid-up and prepaid shares, capital	56,400 70
Paid-up and prepaid shares, dividends	11,586 40
Advances, personal accounts	1,984 57
Salaries	3,960 00
Taxes	888 61
Other expenses	2,444 68
All other disbursements	254 94
Balance, cash in office and bank	60,016 45
Total disbursements	$426,700 86

Installment Shares, With Age, Value, and Withdrawal Value.

Dayton plan.
Dues $1.00 per share per month.
Dividend, last fiscal year, 7.20 per cent.
Book value, dues plus dividend.
Withdrawal value, full book value.

No. 82. TULARE.

TULARE BUILDING AND LOAN ASSOCIATION.

(Incorporated January, 1889.)

J. L. Wilder, Secretary. A. W. Wheeler, President.

Fiscal year ended December 31, 1916.

No. of series, 20. No. of members and investors, 82. No. of shares, 588.

Assets.		Liabilities.	
Loans, on mortgages	$36,845 00	Installment shares, dues	$36,018 00
Cash in bank	9,158 00	Installment shares, profits	8,613 68
Real estate owned	225 00	Advance payments	1,173 30
Furniture and fixtures	200 00	Reserve and undivided profits	530 91
		Sundry ledger accounts	92 11
Total assets	$46,428 00	Total liabilities	$46,428 00

Receipts for Fiscal Year.		Disbursements for Fiscal Year.	
Balance from last report	$1,934 09	Overdrafts and bills payable	$2,000 00
Installment shares, dues	7,354 20	Loans on mortgages and shares	8,390 00
Interest	3,351 45	Interest paid	82 14
Fees	14 00	Dues repaid, installment shares	6,401 00
Loans repaid	15,200 00	Profits repaid, installment shares	1,228 25
Advances repaid, personal accounts	55 95	Advances, personal accounts	55 95
All other receipts, real estate	240 00	Salaries	600 00
		Taxes	149 30
		Other expenses	85 05
		Balance, cash in office and bank	9,158 00
Total receipts	$28,149 69	Total disbursements	$28,149 69

Installment Shares, With Age, Value, and Withdrawal Value.

Serial No.	Age in months	Total dues per share	Book value per share	Withdrawal value
17	120	$120 00	$163 13	$152 34
18	108	108 00	142 62	133 97
20	96	96 00	122 76	116 07
22	84	84 00	104 17	99 12
24	72	72 00	86 84	82 86
26	60	60 00	70 01	65 00
28	48	48 00	54 33	51 17
30	36	36 00	39 60	37 80
32	24	24 00	25 62	24 81
33	12	12 00	12 42	12 21

No. 83. UPLAND.

MAGNOLIA MUTUAL BUILDING AND LOAN ASSOCIATION.

(Incorporated September 24, 1901.)

M. F. Palmer, Secretary. W. H. Craig, Vice President.

Fiscal year ended September 30, 1916.

No. of series, none No. of members and investors, 484. No. of shares, 4,505

Assets.	
Loans, on mortgages	$247,000 00
Arrearages, on interest	3,563 50
Cash in bank	7,395 19
Furniture and fixtures	44 50
Advances, ledger accounts	969 55
Total assets	$258,972 74

Liabilities.	
Installment shares, dues	$87,201 83
Installment shares, profits	24,149 51
Paid-up and prepaid shares, capital	134,500 00
Paid-up and prepaid shares, dividends	6,961 39
Advance payments	162 60
Overdrafts and bills payable	2,500 00
Reserve and undivided profits	3,468 96
Sundry ledger accounts	10 95
All other liabilities, interest on bills payable	17 50
Total liabilities	$258,972 74

Receipts for Fiscal Year.	
Balance from last report	$7,949 10
Installment shares, dues	23,948 54
Paid-up and prepaid shares, dues	39,300 00
Interest	15,868 70
Fines	210 37
Fees	111 50
Loans repaid	31,300 00
Overdrafts and bills payable	4,000 00
Advances repaid, personal accounts	241 82
Total receipts	$122,930 03

Disbursements for Fiscal Year.	
Overdrafts and bills payable	$1,500 00
Loans on mortgages and shares	42,000 00
Interest paid	26 25
Dues repaid, installment shares	16,393 15
Profits repaid, installment shares	3,125 28
Paid-up and prepaid shares, capital	41,600 00
Paid-up and prepaid shares, dividends	8,190 33
Advances, personal accounts	622 74
Salaries	1,200 00
Taxes	299 84
Other expenses	532 75
All other disbursements, furniture	44 50
Balance, cash in office and bank	7,395 19
Total disbursements	$122,930 03

Installment Shares, With Age, Value, and Withdrawal Value.

Dayton plan.
Dues $1.00 per share per month.
Dividend, last fiscal year, 8 per cent.
Book value, dues plus dividend.
Withdrawal value, dues plus profits as per by-laws.

No. 84. VALLEJO.

VALLEJO BUILDING AND LOAN ASSOCIATION.

(Incorporated October 26, 1911.)

J. R. Wilson, Secretary. J. B. McCauley, President.

Fiscal year ended December 31, 1916.

No. of series, none. No. of members and investors, 26. No. of shares, 65.

Assets.		
Loans, on definite contract		$8,916 37
Arrearages—		
On interest	$19 78	
On premium	31 92	
On fines	52	
		52 22
Cash, in office, $20.33; in bank, $274.66		294 99
Furniture and fixtures		107 90
Total assets		$9,371 48

Liabilities.	
Guarantee stock, capital	$4,106 00
Investment certificates, principal	96 00
Investment certificates, dividends	16 06
Overdrafts and bills payable	4,750 00
Reserve and undivided profits	64 52
Loans due and incomplete	338 90
Total liabilities	$9,371 48

Receipts for Fiscal Year.	
Balance from last report	$924 34
Guarantee stock	1,612 50
Investment certificates	5 00
Interest	232 56
Premiums	134 00
Fees	50 80
Loans repaid	1,318 40
Overdrafts and bills payable	6,150 00
Total receipts	$10,427 60

Disbursements for Fiscal Year.	
Overdrafts and bills payable	$1,400 00
Loans on mortgages and shares	8,458 00
Interest paid	76 33
Salaries	70 00
Taxes	53 28
Other expenses	23 28
All other disbursements	51 72
Balance, cash in office and bank	294 99
Total disbursements	$10,427 60

Installment Shares, With Age, Value, and Withdrawal Value.

Dayton plan.
Dues 50 cents per share per month.
Dividend, last fiscal year, 6 per cent.
Book value, dues plus dividend.
Withdrawal value, full book value.

No. 85. VISALIA.

VISALIA BUILDING AND LOAN ASSOCIATION.

(Incorporated January, 1887.)

C. L. Johnson, Secretary. C. J. Giddings, President.

Fiscal year ended January 31, 1917.

No. of series, none. No. of members and investors, 312. No. of shares, 7,281.

Assets.	
Loans, on mortgages	$340,575 00
Arrearages, on interest	401 25
Cash in bank	21,415 07
Real estate owned	1,782 49
Advances, ledger accounts	34 99
Total assets	$364,208 80

Liabilities.	
Installment shares, dues	$151,253 04
Installment shares, profits	69,731 86
Paid-up and prepaid shares, capital	109,700 00
Paid-up and prepaid shares, dividends	3,267 03
Overdrafts and bills payable	15,100 00
Reserve and undivided profits	10,431 19
Loans due and incomplete	4,272 68
All other liabilities, interest on bond payment	453 00
Total liabilities	$364,208 80

Receipts for Fiscal Year.	
Balance from last report	$11,310 27
Installment shares, dues	37,614 16
Paid-up and prepaid shares, dues	8,600 00
Interest	28,627 39
Fines	1 40
Fees	270 50
Loans repaid	76,400 00
Advances repaid, personal accounts	343 48
Total receipts	$163,167 20

Disbursements for Fiscal Year.	
Loans on mortgages and shares	$83,384 36
Interest paid	906 00
Dues repaid, installment shares	25,713 11
Profits repaid, installment shares	8,125 20
Paid-up and prepaid shares, capital	12,800 00
Paid-up and prepaid shares, dividends	6,691 17
Advances, personal accounts	90 11
Salaries	1,800 00
Taxes	385 06
Other expenses	74 63
All other disbursements, real estate	1,782 49
Balance, cash in office and bank	21,415 07
Total disbursements	$163,167 20

Installment Shares, With Age, Value, and Withdrawal Value.

Dayton plan.
Dues 50 cents per share per month.
Dividend, last fiscal year, 8.70 per cent.
Book value, dues plus dividend.
Withdrawal value, full book value.

No. 86. WOODLAND.

NORTHERN CALIFORNIA BUILDING AND LOAN ASSOCIATION.

(Incorporated October 2, 1911.)

JAMES L. HARE, Secretary. HARRY L. HUSTON, President.

(Fiscal year ended December 31, 1916.)

No. of series, none. No. of members and investors, 25. No. of shares, 250.

Assets.		Liabilities.	
Loans, on definite contract, $25,207.86; on shares, $160	$25,367 86	Guarantee stock, capital	$10,638 30
Cash in bank	3,938 88	Guarantee stock, surplus	4,254 20
Furniture and fixtures	500 00	Installment certificates, dues	1,754 50
		Installment certificates, profits	224 03
		Paid-up and prepaid certificates, capital	12,650 00
		Paid-up and prepaid certificates, dividends	195 71
		All other liabilities, withdrawal fees	90 00
Total assets	$29,806 74	Total liabilities	$29,806 74

Receipts for Fiscal Year.		Disbursements for Fiscal Year.	
Balance from last report	$1,344 50	Overdrafts and bills payable	$7,000 00
Installment certificates, dues	364 00	Loans on mortgages and shares	4,487 50
Paid-up and prepaid certificates, dues	6,500 00	Interest paid	160 55
Interest	2,961 12	Dues repaid, installment certificates	1,627 00
Fees	50 90	Profits repaid, installment certificates	201 67
Loans repaid	9,506 59	Paid-up and prepaid certificates, capital	2,150 00
Advances repaid, personal accounts	164 04	Paid-up and prepaid certificates, dividends	525 14
All other receipts	159 59	Advances, personal accounts	160 00
		Salaries	420 00
		Taxes	62 00
		Other expenses	265 72
		All other disbursements, withdrawal fees, etc.	52 28
		Balance, cash in office and bank	3,938 88
Total receipts	$21,050 74	Total disbursements	$21,050 74

Installment Shares, With Age, Value, and Withdrawal Value.

Dayton plan.
Dues, 50 cents per share per month.
Dividend, last fiscal year, 6 per cent.
Book value, dues plus dividend.
Withdrawal value, same as book value.

FOREIGN ASSOCIATION.

SALT LAKE CITY, UTAH.

WESTERN LOAN AND BUILDING COMPANY.

(Incorporated April, 1892.)

DR. JOHN T. WHITE, Secretary. P. W. MADSEN, President.

Statement of condition December 31, 1916.

No. of series, 141. No. of shares, 136,636.

Assets.		Liabilities.	
Mortgage loans (net)	$2,123,605 09	Permanent reserve stock	$150,000 00
Share loans	54,662 21	Guaranty fund stock	100,000 00
Cash in office	18,198 10	Installment stock	1,705,004 83
Cash in bank	157,386 92	Prepaid stock	58,980 48
Office building	45,000 00	Full paid stock	34,000 00
Other real estate	3,000 00	"S" stock	220,270 56
Advances to borrowers	18,405 15	Dividends unpaid	46 00
		Incomplete loans	31,433 01
Advances, insurance and taxes	8,149 59	Sundry ledger accounts	8,460 79
Advances, sundry	3,026 42	Reserve fund	9,702 86
		Undivided profits	113,534 95
	$2,431,433 48		$2,431,433 48

California Business.

Shares of stock in force	12,563
Dues paid in on same	$68,871 48
Mortgage loans in force (net value)	107,871 45
Share loans in force	945 35
Face value of loans on deposit with state of California	111,775 00
Repayments on same	25,392 08
Net value	86,382 92

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ANNUAL REPORT

on the

Building and Loan Associations

of the

State of California

by the

BUILDING AND LOAN COMMISSIONER

In accordance with an Act of the Legislature, approved April 5, 1911

to

His Excellency WILLIAM D. STEPHENS, Governor of the State of California

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August 10, 1918

CALIFORNIA STATE PRINTING OFFICE
SACRAMENTO
1918

40296

REPORT

OF THE

BUREAU OF BUILDING AND LOAN SUPERVISION.

Office of the Building and Loan Commissioner,
San Francisco, August 10, 1918.

To His Excellency, William D. Stephens, *Governor of California*.

Sir: In compliance with the requirements of the Building and Loan Commission Act, I have the honor to submit for your consideration the Twenty-fifth Annual Report of this department, relative to the operations and conditions of the building and loan associations of California, for the sixty-ninth fiscal year, ended June 30, 1918.

For the first time for several years there has been neither an increase by the formation of new associations nor a decrease by any retirements from the active roll. The same 86 associations shown in the report for the sixty-eighth fiscal year are represented in the tabulations and calculations herein presented.

The gross assets of all the associations now appear to aggregate $37,120,998.91—a net increase of $1,192,552.07—the larger percentage of which is represented by an increase of $1,100,035.87 in the loans upon real estate and stock security.

The schedule of "Distribution of Assets by Counties" shows that in 16 counties 63 associations made an increase of $1,408,040.68 and that 11 counties with 23 associations show a decrease of $215,488.61.

From an examination of the schedule of "Changes in Assets and Liabilities" it will be noted that of the assets only Cash in Hand and Arrearages show a decrease, and of the liabilities only Installment Shares, Dues and Profits, Bills Payable and Loans Due and Incomplete have decreased in volume—all other features showing an increase.

With the decrease in the Dues and Profits to the credit of installment shares there follows a decrease in the number of members, but with a slight increase in the number of holders of investment certificates, leaving a net decrease of members and investors of 1818.

With the material increase of the amount to the credit of Paid-up and Prepaid Shares the average investment per member and investor now appears as $825.33, or an average increase of $91.55 each.

The number of borrowers is reported as 21,023—an increase of 724, with an average loan to each of $1,605.33.

Sixty-one associations report holding 316 pieces of real estate with a book value of $1,400,275.65. Of this $191,476.31 is represented by the office buildings purchased and owned by seven associations. The balance, $1,208,799.34, represents 309 pieces acquired as the result of the failure of borrowers to continue their periodical payments in accordance with the terms of the contracts entered into upon obtaining their loans. The aggregate value, above noted, represents an increase of $271,812.01 in excess of the reported value of the holdings at the date of the previous reports made to this office. The reports from which these tabulations are made show that sales of the holdings of previous reports amounting to $631,719.04 were made during the past year. The book value of the real estate above noted is the equivalent of 3.77 per cent of the gross assets.

The Reserve and Undivided Profits now aggregate $1,469,786.92, the equivalent of 4.44 per cent of the amount of the average of all loans in force for the year, or 4.49 per cent of all credits to members and investors other than the holders of guarantee stock, the principal and surplus of which, amounting to $1,252,709.80, is a further guarantee to investors in associations issuing that class of stock.

The net profits reported amount to 6.964 per cent of the average loans in force for the year, or 7.889 per cent of the Dues Capital, and the operating expenses were respectively 1.229 and 1.392 per cent, or 14.720 per cent of the gross income.

The payments made to members and investors on account of withdrawals during the year summarize as follows:

On account of dues and invested capital	$8,346,670 00
On account of profits apportioned	2,097,200 00
An aggregate of	$10,443,870 00

or more than 29 per cent of the total assets of all the associations at the beginning of the year.

LOANING RATES.

The 86 associations have 14 different loaning rates distributed as follows:

45 associations loan at 7% and 4 varying fractions.
24 associations loan at 8% and 2 varying fractions.
8 associations loan at 9% and 9.60%.
9 associations loan at 10, 10.20, 10.60 and 10.80%.

Several have two or more rates at which loans are made, depending upon locality, security and amount of loan. The mean average of all the above rates is 8.09 per cent, but this mean average can never be accurately realized unless the volume of loans at each of the various rates shall be practically the same. If the volume of loans at the higher rates exceeds that at the lower rates the realization will exceed the mean average rate, and vice versa if the volume at the lower rates exceeds that of the higher, the average rate of realization will be less than the mean average of all the rates.

The gross income from interest, reported during the past fiscal year, is the equivalent of 8.265 per cent of the apparent average volume of loans in force for the entire year, being .175 of 1 per cent in excess of the mean average of the above rates, indicating that the larger volume of the loans bear a rate in excess thereof.

Elsewhere the apparent gross income is calculated as being 8.349 per cent of the average volume of loans in force for the year. This is .084 of 1 per cent in excess of the interest collections, presumably covering income realized from other sources. It is interesting to note the result of these calculations when assembled.

Mean average interest rate	8.090%
Income from interest collections	8.265%
Apparent gross income	8.349%

DIVIDEND RATES.

The rates of dividend distributed to installment shares cover even a wider range than the rates of interest at which loans are made, there being 21 different rates ranging from 5 to 13 per cent, distributed as follows:

7 associations paid 5, 5¼ and 5½%.
40 associations paid 6, 6¼, 6.33, 6½ and 6¾%.
25 associations paid 7, 7.20, 7½ and 7.90%.
9 associations paid 8, 8½, 8.70, 8.75 and 8.90%.
1 association paid 9.50%.
2 associations paid 10%.
1 association paid 12%.
1 association paid 13%.

The mean average of all the above dividend rates distributed to installment shares for the past year is 6.85 per cent.

The rates paid to holders of fully paid up shares and certificates, which comprise much the larger investment, ranges now from 5 to 6 per cent.

It will be observed elsewhere that the apportionment of dividends to the several classes of investment, during the past year, has been as follows:

To installment shares	$859,575 57
To full-paid shares	456,547 74
To investment certificates	628,128 03
To guarantee stock	121,713 13

DOMESTIC ASSOCIATIONS.

Active roll June 30, 1917	86
New associations licensed	none
Retired	none
Active roll June 30, 1918	86
In liquidation—	
Mission Home and Loan Association, San Francisco; Continental Building and Loan Association, San Francisco; State of California Building and Loan Association, San Diego; Benicia Building and Loan Association, Benicia	4
Total	90

FOREIGN ASSOCIATIONS.

The only foreign association thus far licensed in this state is the Western Loan and Building Company of Salt Lake City, Utah, the condition of which is shown on last page of appendix.

CHANGES IN ASSETS SINCE 1905.

The changes in assets, as well as in the total roll and number reporting since 1905, are as follows:

Years	Total roll	Number reporting	Assets	Increase
1906	131	106	$19,228,938 88	
1907	125	107	19,522,896 86	$293,957 98
1908	120	107	19,635,657 94	112,761 08
1909	120	105	20,228,116 40	592,458 46
1910	113	107	21,255,176 49	1,027,060 09
1911	105	96	23,340,012 38	2,084,835 89
1912	107	91	24,866,571 97	1,526,559 59
1913	98	93	28,316,021 97	3,449,450 00
1914	97	92	29,515,762 57	1,199,740 60
1915	97	89	30,441,084 03	925,321 46
1916	96	89	32,794,018 18	2,352,934 15
1917	91	86	35,928,446 84	3,134,428 66
1918	90	86	37,120,998 91	1,192,552 07

The California business of the above named foreign association, aggregating $215,871.35, is not included in the tabulations of the assets and gains of the 86 California associations, but is taken into consideration in the fixing of the annual license fees for the support of this office.

ASSETS AND LIABILITIES.

Assets.

Loans on mortgages and stock	$33,749,011 26
Arrearages	171,840 01
Cash in office and bank	1,144,179 46
Real estate owned	1,400,275 55
Furniture and fixtures	45,262 25
Advances—ledger accounts	250,329 00
Other assets—including $190,850 Liberty Bonds	360,101 38
Total assets	$37,120,998 91

Liabilities.

Guarantee stock—capital	1,053,518	48
Guarantee stock—surplus	226,567	08
Installment shares—dues	10,591,907	26
Installment shares—profits	3,144,621	78
Paid-up and prepaid shares—capital	6,952,997	16
Paid-up and prepaid shares—dividends	369,472	48
Investment certificates—principal	11,267,028	33
Investment certificates—dividends	384,466	21
Advance payments	41,483	94
Overdrafts and bills payable	829,647	75
Reserve and undivided profits	1,469,786	92
Loans due and incomplete	450,290	83
Sundry ledger accounts	288,023	25
All other liabilities	51,187	44
Total liabilities	$37,120,998	91

RECEIPTS AND DISBURSEMENTS.

Receipts.

Balance from last report	$1,760,940	87
Guarantee stock	103,995	30
Installment shares—dues	3,653,932	86
Paid-up and prepaid shares—dues	1,963,871	85
Investment certificates	3,937,307	54
Interest	2,702,302	39
Premiums	32,954	83
Fines	20,368	04
Fees	11,086	95
Loans repaid	10,256,519	98
Overdrafts and bills payable	1,278,905	53
Advances repaid—personal accounts	196,653	93
All other receipts	698,569	87
Total receipts	$26,617,409	94

Disbursements.

Overdrafts and bills payable	1,245,545	44
Loans on mortgages and shares	11,567,179	83
Interest paid	57,026	81
Dividends on guarantee stock	85,128	97
Dues repaid—installment shares	3,935,613	67
Profits repaid—installment shares	1,050,458	67
Paid-up and prepaid shares—capital	873,603	48
Paid-up and prepaid shares—dividends	356,942	64
Investment certificates—principal	3,537,424	16
Investment certificates—dividends	604,671	44
Advances—personal accounts	448,331	69
Salaries	224,854	42
Taxes	51,766	61
Other expenses	181,972	85
All other disbursements	1,252,709	80
Balance—cash in office and bank	1,144,179	46
Total disbursements	$26,617,409	94

CHANGES IN ASSETS AND LIABILITIES.

Assets.

	Increase	Decrease
Loans on mortgages and stock	$1,100,035 87	
Arrearages	----------	$7,798 10
Cash in office and bank	----------	611,836 41
Real estate owned	271,812 01	
Furniture and fixtures	17,439 21	
Advances—ledger accounts	69,562 68	
Other assets, including $190,850.00 Liberty Bonds	353,336 81	
Net increase	$1,192,552 07	

Liabilities.

Guarantee stock—capital	$102,242 93	
Guarantee stock—surplus	51,804 15	
Installment shares—dues	----------	308,198 83
Installment shares—profits	----------	94,577 25
Paid-up and prepaid shares—capital	1,184,185 20	
Paid-up and prepaid shares—dividends	68,907 02	
Investment certificates—principal	326,657 92	
Investment certificates—dividends	64,332 74	
Advance payments	11,482 22	
Overdrafts and bills payable	----------	2,985 72
Reserve and undivided profits	83,086 26	
Loans due and incomplete	----------	454,773 97
Sundry ledger accounts	147,652 48	
All other liabilities	12,736 92	
Net increase	$1,192,552 07	

DISTRIBUTION OF ASSETS BY COUNTIES.

Counties	Associations	Number reporting	Assets	Increase	Decrease
Alameda	7	7	$1,280,700 68	$51,556 05	
Fresno	1	1	147,506 60		$23,069 48
Humboldt	1	1	27,888 07		2,103 81
Kern	2	2	572,556 76	15,915 34	
Los Angeles	11	11	17,161,940 49	881,671 45	
Madera	1	1	37,864 58	5,189 91	
Marin	3	3	242,479 16		25,987 95
Merced	1	1	167,025 02	21,347 13	
Napa	1	1	270,465 52	9,455 06	
Orange	3	3	1,228,553 35		52,674 42
Placer	1	1	59,524 82	4,943 27	
Riverside	2	2	182,005 29		1,502 93
Sacramento	1	1	445,444 06	35,394 80	
San Bernardino	4	4	2,614,065 47	58,351 63	
San Diego	3	3	543,628 88		20,993 70
San Francisco	20	20	4,398,274 75	52,653 57	
San Luis Obispo	2	2	196,457 74		5,314 75
San Joaquin	3	3	2,149,173 62	184,672 35	
San Mateo	2	2	467,367 43		27,919 83
Santa Barbara	2	2	1,165,542 46	41,100 46	
Santa Clara	6	6	2,513,995 56	27,599 81	
Santa Cruz	1	1	36,950 62		1,327 24
Solano	1	1	10,522 86	1,151 38	
Sonoma	2	2	190,131 84		5,244 59
Tulare	3	3	452,959 66		49,349 91
Ventura	1	1	521,667 13	10,538 72	
Yolo	1	1	36,306 49	6,499 75	
	86	86	$37,120,998 91	$1,408,040 68	$215,488 61
Twenty-seven counties, net increase				1,192,552 07	

STATISTICAL INFORMATION.

Number of members—Male, 17,301; female, 11,343; total	28,644
Number of investors—Male, 7,122; female, 4,643; total	11,765
Total members and investors	40.409
Average investment, including accumulated earnings	$825.33
Number of borrowers	21,023
Average amount of each loan	$1,605.33
Number of new mortgage loans for year	4.641
Number of new share loans for year	876
Number of building loans for year	1,216
Total number of building loans to date	49,238
Percentage of new loans to loans in force	34.27%
Percentage of loans repaid	26.38%
Mean average of interest rates in force	8.09%
Average of interest collections reported	8.265%
Apparent gross income to average loans in force	8.349%
Shares in force last report	373,546
Shares issued since last report	56,466
Shares canceled since last report	68,800
Shares in force this report	361,212
Investment certificates in force last report	110,797
Investment certificates issued since last report	35,455
Investment certificates canceled since last report	32,561
Investment certificates in force this report	113,691
Number of associations owning real estate	61
Number of pieces of real estate owned	316
Number of associations owning own office buildings	7
Book value of all real estate owned	$1,400,275.65
Reserve and undivided profits	1,469,786.92
Guarantee capital and surplus	1,280,085.56
Aggregate surplus for protection of members and investors	2,749,872.48

Net Profits.

Net profits reported for year	$2,304,821.42
Percentage to average loans in force	6.964%
Average for past 12 years	6.947%
Percentage of average investment	7.120%
Average for past 12 years	7.418%
The dividend rate to installment shares ranges from 5 to 13 per cent per annum—only seven associations paying less than 6 per cent—with a mean average rate of	6.850%
The amount of dividend apportioned to installment shares was	$859,575.57
To full paid shares	456,547.74
To investment certificates	628,128.03

SALARIES, TAXES AND OTHER EXPENSES.

	Amount	Percentage to loans in force
Salaries	$224,854 42	0.679
Taxes	51,766 61	0.156
Other expenses	181,972 85	0.550
Totals	$458,393 88	1.385
Percentage at last report		1.312

OPERATING EXPENSES TO LOANS.

The element of taxes, while an expense that is a necessity and must be met, is not within the control of the management, hence must be eliminated in order to determine the real operating expenses, which then appear as follows:

For salaries	0.679%
For other expenses	0.550%
Total	1.229%

upon the average loans in force for the year, as against 1.145 per cent for the year ending June 30, 1917.

OPERATING EXPENSES TO DUES CAPITAL.

Based on the average of dues capital paid in on all classes of shares and certificates, the salaries and other operating expenses show the following percentages:

For salaries	0.769%
For other expenses	0.623%
Total	1.392%
This percentage in last report was	1.418%

GROSS INCOME AND PERCENTAGE OF EXPENSES TO INCOME.

The percentage of the gross income of all the associations to the average volume of "Loans in Force" can be very closely approximated as follows:

	1918 per cent	1917 per cent	1916 per cent
Net profits reported as above	6.964	7.353	7.392
Taxes paid	0.156	0.167	0.205
Operating expenses	1.229	1.145	1.268
Apparent gross income	8.349	8.665	8.865
Ratio of operating expenses to gross income	14.720	13.214	14.387

GROSS INCOME AND PERCENTAGE OF EXPENSES TO DUES CAPITAL.

Based upon the "dues capital" in force for the year, exclusive of profits or dividends credited or paid, the apparent percentages are as follows:

	1918 per cent	1917 per cent	1916 per cent
Net profits reported	7.889	8.354	8.765
Taxes paid	0.177	0.207	0.243
Operating expenses	1.392	1.418	1.508
Apparent gross income	9.458	9.979	10.516
Ratio of operating expenses	14.718	14.209	14.340

ASSOCIATIONS HAVING A PAID IN GUARANTEE CAPITAL.

Associations	Location	Assets	Capital paid in	Surplus and reserve	Rate of dividend to installment shares, per cent
Central	Alameda	$304,378	$15,554	$7,835	6
Berkeley Home	Berkeley	60,225	16,100	1,207	6
Corona Mutual	Corona	44,755	5,000	500	6
Bankers	Los Angeles	28,038	16,138	----------	6
Fidelity	Los Angeles	7,834,938	220,978	475,000	12
State Mutual	Los Angeles	4,147,115	200,000	123,017	7½
Southern California	Los Angeles	950,118	51,000	23,633	8
Mutual	Long Beach	509,057	40,000	4,000	7
Orange	Orange	586,655	25,000	12,773	8½
Palo Alto Mutual	Palo Alto	534,951	30,750	4,170	6
California Security	Pasadena	1,056,055	100,000	12,129	6
Pasadena	Pasadena	248,395	9,000	6,085	7
Home Builders	Pomona	736,788	100,000	15,000	10
Home Investment	Redlands	740,494	100,000	20,000	7
California Home	San Francisco	652,678	37,500	9,769	7
Home Mutual	San Francisco	261,062	25,000	15,923	6
Santa Cruz County	Santa Cruz	36,950	21,700	2,021	7
Security	Stockton	295,855	25,000	3,642	6
Vallejo	Vallejo	10,522	4,159	303	6
Northern California	Woodland	36,306	10,639	6,033	6
20 associations		$19,075,335	$1,053,518	$743,040	av. 7.03

ASSOCIATIONS IN LIQUIDATION.

At the date of the Twenty-fourth Annual Report there were five associations in process of liquidation. The affairs of the "Fairmont" of San Francisco are now reported as finally closed and that name has now been dropped from the rolls of this office.

The "Mission Home" of San Francisco—in voluntary liquidation—still has two pieces of real estate to be disposed of and as soon as this can be accomplished its affairs will be speedily closed.

The "Continental"—in bankruptcy under the jurisdiction of the United States District Court—is apparently being liquidated by the "trustee" as speedily as conditions will permit.

Because of the inability of the receiver to dispose of real estate holdings of the "State of California Mutual" of San Diego, at satisfactory prices, no progress has there been made tending to a final settlement of its affairs.

In the matter of the "Benicia Building and Loan Association," of Benicia, in liquidation by this office, the necessity of being obliged to institute proceedings in foreclosure of the security held for one loan has delayed the final settlement. Thus far 61 per cent of the allowed claims has been distributed.

LIBERTY BONDS.

At the dates upon which the fiscal years of the several associations ended, and their reports were made to this office, 33 associations had then acquired $190,850.00 Liberty Bonds. Several associations had entered their further subscriptions, but the deliveries had not been made. Other associations have made subscriptions to the third loan since the filing of their annual reports, the several amounts of which will not appear of record until their reports for the seventieth fiscal year are filed in this office.

While, as before stated, no new associations have been formed during the past fiscal year, there have been numerous inquiries for the laws and for the instructions and regulations established therefor by this office. All information and assistance asked for has been freely given, and where the locality from which it originated would seem to indicate that a new association could be successfully operated, the formation of such an one has been freely encouraged, and it is quite possible that several may materialize at an early date, and such assistance as is compatible with existing laws and conditions will be cheerfully accorded upon application.

It is impossible under existing laws to determine the exact gross assets of all the associations of the state as of any particular date, because of the requirement that their reports shall be made to this office as of the close of their several fiscal years, hence the tabulations and the calculations therefrom may perhaps not be quite as accurate and satisfactory, from a statistical point of view, and they could be made if these reports were made and filed in this office as of a specific date; but unless the fiscal year of every association ended as of that specific date reports made as of that date would not, for any purpose beyond the determination of the exact assets and liabilities, be as complete and satisfactory as where they contain the entire business of a regular fiscal year, including the apportionment of the profits for the year and the annual closing of the books. For the purpose of keeping in closer touch with the affairs of the several associations and the immediate checking up of the reports as they arrive, the above disadvantage of the existing law can hardly be looked upon with material disfavor.

CONCLUSION.

The appendix to this report, when published, will contain the usual condensed reports of each association as of the close of its fiscal year, with the book and withdrawal values at annual periods, of the shares of serial associations, and the dues, dividend rate, book and withdrawal values of the permanent or "Dayton" plan associations, arranged alphabetically both as to location and name, closing with the last report of foreign associations. It will also contain a detailed statement of the receipts of this department, as required by law, and the names and addresses of the several secretaries, arranged alphabetically, by cities and towns.

Respectfully submitted,

GEO. S. WALKER,
Commissioner.

Attest:
J. L. FIELDS, *Secretary.*

STATEMENT OF RECEIPTS ON ACCOUNT OF LICENSES AND ASSESSMENTS FOR EXPENSES.

Fiscal Year Ending June 30, 1918.

Associations	Location	Amount
Central Loan Association	Alameda	$74 70
Columbian Mutual Building and Loan Assn.	Alameda	47 16
Savings Loan and Building Association	Anaheim	35 94
Kern County Mutual Building and Loan Assn.	Bakersfield	111 95
People's Mutual Building and Loan Association	Bakersfield	51 67
Berkeley Home Investment Association	Berkeley	10 00
Corona Mutual Building and Loan Association	Corona	13 42
Escondido Mutual Building and Loan Association	Escondido	10 00
Fortuna Building and Loan Association	Fortuna	10 00
Mutual Building and Loan Association	Fresno	49 69
Livermore Mutual Building and Loan Association	Livermore	10 20
Mutual Building and Loan Association	Long Beach	102 73
Home Investment Building and Loan Association	Los Angeles	14 45
Metropolitan Loan Association	Los Angeles	77 79
Southern California Loan Association	Los Angeles	276 81
Fidelity Savings and Loan Association	Los Angeles	2,076 28
State Mutual Building and Loan Association	Los Angeles	1.286 70
Bankers Guaranty-Loan Company	Los Angeles	10 00
Los Gatos Building and Loan Association	Los Gatos	10 00
Madera Mutual Building and Loan Association	Madera	11 07
Merced Mutual Building and Loan Association	Merced	43 54
Tamalpais Mutual Building and Loan Assn	Mill Valley	15 78
Napa Building and Loan Association	Napa	78 18
Newcastle Building and Loan Association	Newcastle	16 35
Alameda County Loan Association	Oakland	163 15
Cosmopolitan Mutual Building and Loan Assn	Oakland	45 60
People's Mutual Building and Loan Association	Ontario	171 44
Orange Building and Loan Association	Orange	175 10
Palo Alto Mutual Building and Loan Association	Palo Alto	157 59
Pasadena Building and Loan Association	Pasadena	55 58
California Security Loan Company	Pasadena	281 88
Paso Robles Mutual Building and Loan Assn.	Paso Robles	10 00
Petaluma Mutual Loan Association	Petaluma	16 20
Pleasanton Mutual Building and Loan Assn.	Pleasanton	10 00
Mutual Building and Loan Association	Pomona	323 70
Home-Builders Loan Association	Pomona	194 16
Porterville Mutual Building and Loan Assn.	Porterville	23 40
San Mateo County Building and Loan Assn.	Redwood City	112 60
Home Investment Association	Redlands	183 18
Riverside County Mutual Building and Loan Assn.	Riverside	42 57
Sacramento Building and Loan Association	Sacramento	123 00
Santa Fe Building and Loan Association	San Bernardino	328 50
San Diego Building and Loan Association	San Diego	89 33
Silver Gate Building and Loan Association	San Diego	71 73
Argonaut Mutual Building and Loan Association	San Francisco	13 64
Bay City Building and Loan Association	San Francisco	19 35
Bay View Building and Loan Association	San Francisco	14 58
California Home Building-Loan Company	San Francisco	200 22
California Mutual Savings Fund Loan and Building Association	San Francisco	19 77
Citizens Building and Loan Association	San Francisco	156 90
Empire Building and Loan Association	San Francisco	16 92
Eureka Building and Loan Association	San Francisco	13 23
Fidelity Building and Loan Association	San Francisco	55 29
Franklin Mutual Building and Loan Association	San Francisco	68 28

Associations	Location	Amount
Globe Mutual Building and Loan Association	San Francisco	38 37
Home Mutual Deposit Loan Company	San Francisco	75 75
Mechanics Building and Loan Association	San Francisco	25 80
Occidental Loan Association	San Francisco	23 34
Pacific Loan Association	San Francisco	11 24
Pacific States Savings and Loan Company	San Francisco	402 06
Provident Mutual Loan Association	San Francisco	50 61
Progress Mutual Loan Association	San Francisco	17 10
Union Loan Association	San Francisco	13 08
Western Loan Association	San Francisco	23 82
Mutual Building and Loan Association of San Jose and College Park	San Jose	262 25
Nucleus Building and Loan Association	San Jose	75 24
San Jose Building and Loan Association	San Jose	166 44
San Luis Building and Loan Association	San Luis Obispo	48 73
San Mateo Mutual Building and Loan Assn.	San Mateo	34 20
Marin County Mutual Building and Loan Assn.	San Rafael	45 40
Home Mutual Building and Loan Association	Santa Ana	165 20
Loan and Building Association	Santa Barbara	122 23
Santa Barbara Mutual Building and Loan Assn.	Santa Barbara	211 10
Santa Clara Building and Loan Association	Santa Clara	72 78
Santa Cruz County Building and Loan Assn.	Santa Cruz	11 48
Santa Paula Building and Loan Association	Santa Paula	152 13
Santa Rosa Building and Loan Association	Santa Rosa	39 09
Sausalito Mutual Loan Association	Sausalito	11 70
San Joaquin Valley Building and Loan Assn.	Stockton	247 23
Security Building and Loan Association	Stockton	56 31
Stockton Land, Loan and Building Association	Stockton	276 60
Tulare Building and Loan Association	Tulare	13 92
Magnolia Mutual Building and Loan Association	Upland	72 70
Vallejo Building and Loan Association	Vallejo	10 00
Visalia Building and Loan Association	Visalia	107 97
Northern California Building and Loan Assn.	Woodland	10 00
Western Loan and Building Company	Salt Lake City	32 65
		$10,528 42
Agents' licenses		9 00
Revolving from last report		300 00
		$10,837 42

Deposited with State Treasurer:

January 24, 1918, Controller's Receipt No. 2086	$7,500 00
March 6, 1918, Controller's Receipt No. 2519	3,028 42
June 26, 1918, Controller's Receipt No. 3637	9 00
	$10,537 42
Balance to new revolving fund	$300 00

STATE OF CALIFORNIA,
CITY AND COUNTY OF SAN FRANCISCO. } ss.

J. L. Fields, Secretary for the Building and Loan Commissioner, being first duly sworn, deposes and says the foregoing is a correct statement of the receipts for the fiscal year ended June 30, 1918, and of the disposition of same.

Subscribed and sworn to before me, this ninth day of August, 1918.

J. L. FIELDS

GEO. S. WALKER, *Commissioner.*

SECRETARIES AND THEIR LOCAL ADDRESSES.

Location	Name	Associations	Address
Alameda	H. Rosenthal	1	2301 Central avenue.
Anaheim	Fred A. Backs, Jr.	1	Anaheim.
Bakersfield	E. W. Spiers	1	Producers Savings Bank.
Bakersfield	Arthur S. Crites	1	First Bank of Kern.
Berkeley	F. H. Clark	1	105 Fed. Realty Bldg., Oakland.
Corona	John P. Key	1	First National Bank Bldg.
Escondido	L. A. Cassou	1	Escondido Savings Bank.
Fortuna	C. A. Friedenbach	1	Fortuna.
Fresno	Wick W. Parsons	1	Bank of Italy.
Los Angeles	W. A. Bonynge	1	Commercial National Bank.
Los Angeles	Julius H. Martin	1	431 W. Fifth street.
Los Angeles	S. L. Roland	1	508-9 Title Insurance Bldg.
Los Angeles	C. J. Wade	1	722 S. Spring street.
Los Angeles	G. H. Wadleigh	2	601 S. Hill street.
Los Gatos	E. G. Angell	1	Los Gatos.
Long Beach	W. S. Stevens	1	145 Broadway.
Livermore	T. E. Knox	1	First National Bank.
Madera	E. M. McCardle	1	Madera Abstract Company.
Merced	J. H. Simonson	1	Merced.
Mill Valley	Paul Helmore	1	P. O. Box 575.
Napa	John N. Mount	1	112 First street.
Newcastle	John Wallace	1	Newcastle.
Oakland	W. S. Gould	1	1130 Broadway.
Oakland	C. P. Hoag	1	563 Sixteenth street.
Oakland	R. R. Read	1	88 Blake & Moffatt Bldg.
Ontario	J. O. Henderson	1	235 N. Euclid avenue.
Orange	Osman Pixley	1	Orange.
Palo Alto	Edward Jessurun	1	259 University avenue.
Pasadena	E. D. Hill	1	18 N. Marengo avenue.
Pasadena	A. J. Morris	1	170 E. Colorado avenue.
Paso Robles	F. G. Wetzel	1	First National Bank.
Petaluma	F. A. Cromwell	1	103 Main street.
Pleasanton	T. H. Silver	1	Bank of Pleasanton.
Pomona	W. D. Frederick	1	260 S. Thomas street.
Pomona	C. E. Greaser	1	261 S. Thomas street.
Porterville	C. O. Premo	1	305 Mill street.
Redlands	J. Warren Smith	1	Fifth and Citrus streets.
Redwood City	H. W. Schaberg	1	90 Broadway.
Riverside	E. L. Covey	1	661 Eighth street.
Sacramento	Frank Hickman	1	724 J street.
San Bernardino	John Flagg	1	367 E street.
San Diego	J. R. Beardsley	1	940 Third street.
San Diego	H. A. Croghan	1	411 E street.
San Francisco	D. A. Steinbaugh	1	1208 Railroad avenue.
San Francisco	Wm. E. Bouton	5	255 Montgomery street.
San Francisco	B. Fedde	1	955 Market street.
San Francisco	B. M. Gunzburger	3	1933 Ellis street.
San Francisco	R. L. Handy	1	206-7-8 Hearst Bldg.
San Francisco	A. R. Knoll	1	270 Bush street.
San Francisco	R. F. Cassidy	1	270 Bush street.
San Francisco	W. S. Pardy	1	550 California street.
San Francisco	N. Steinberger	2	715 Clunie Bldg.
San Francisco	B. M. Stich	3	1933 Ellis street.
San Francisco	Fremont Wood	1	405 Pine street.
San Jose	C. H. Johnson	1	12 N. First street.
San Jose	Ralph E. Sanders	1	34 E. San Antonio street.
San Jose	W. M. Sontheimer	1	81 W. Santa Clara street.

Location	Name	Associations	Address
San Luis Obispo	M. Lewin	1	702 Monterey street.
San Mateo	C. H. Kirkbride	1	318 B street.
San Rafael	L. A. Lancel	1	713 Fourth street.
Santa Ana	O. M. Robbins	1	115 W. Fourth street.
Santa Barbara	J. M. Abbott	1	1016 State street.
Santa Barbara	J. M. Warren	1	Santa Barbara County Nat. Bk.
Santa Clara	F. O. Roll	1	1129 Franklin street.
Santa Cruz	Geo. W. Wood	1	96 Pacific avenue, room 14.
Santa Paula	H. H. Youngken	1	Santa Paula.
Santa Rosa	C. D. Barnett	1	629 Fourth street.
Sausalito	John J. Ross	1	Sausalito.
Stockton	C. E. Littlehale	1	323 E. Weber street.
Stockton	A. M. Noble	1	15 S. Hunter street.
Stockton	F. L. Williams	1	26 N. San Joaquin street.
Tulare	J. L. Wilder	1	211 E. Kern street.
Upland	M. F Palmer	1	267 E. Ninth street.
Vallejo	J. R. Wilson	1	318½ Georgia street.
Visalia	C. L. Johnson	1	Visalia Abstract Company.
Woodland	James L. Hare	1	Beamer Block.
Salt Lake City	John T. White	1	45-49 E. First South street.

APPENDIX

Detailed Statement of the Condition

of the

Building and Loan Associations

of the

State of California

As compiled from the reports to the Commissioner for the fiscal year ending June 30, 1918

ARRANGED ALPHABETICALLY BY CITIES AND TOWNS

BUILDING AND LOAN ASSOCIATIONS.

No. 1. ALAMEDA.

CENTRAL LOAN ASSOCIATION.

(Incorporated July 29, 1909.)

H. ROSENTHAL, Secretary. F. N. DELANOY, President.

Fiscal year ended June 30, 1918.

No. of series, none. No. of members and investors, 300. No. of shares, 5,905.

Assets.	
Loans, on mortgages	$283,752 56
Arrearages, on interest	2,337 47
Cash in bank	7,415 76
Real estate owned	2,997 68
Furniture and fixtures	1,148 80
Advances, ledger accounts	726 17
Other assets, Liberty Bonds	6,000 00
Total assets	$304,378 44

Liabilities.	
Guarantee stock, capital	$15,554 00
Guarantee stock, surplus	7,835 53
Installment shares, dues	170,227 10
Installment shares, profits	29,855 97
Investment certificates, principal	48,050 00
Investment certificates, dividends	911 17
Overdrafts and bills payable	20,500 00
Loans due and incomplete	11,082 83
Sundry ledger accounts	8 82
All other liabilities, guarantee dividends unpaid	353 02
Total liabilities	$304,378 44

Receipts for Fiscal Year.	
Balance from last report	$2,057 42
Installment shares, dues	50,225 07
Investment certificates	14,500 00
Interest	17,964 95
Loans repaid	25,447 03
Overdrafts and bills payable	67,500 00
Advances repaid, personal accounts	454 84
All other rece'pts, real estate	2,856 03
Total receipts	$181,005 34

Disbursements for Fiscal Year.	
Overdrafts and bills payable	$57,000 00
Loans on mortgages and shares	60,363 59
Interest paid	903 60
Dividends on guarantee stock	891 26
Dues repaid, installment shares	30,243 19
Profits repaid, installment shares	2,637 07
Investment certificates, principal	9,500 00
Investment certificates, dividends	2,141 64
Advances, personal accounts	1,132 98
Salaries	988 00
Taxes	238 70
Other expenses	674 18
All other disbursements, Liberty Bonds, etc.	6,875 37
Balance, cash in office and bank	7,415 76
Total disbursements	$181,005 34

Installment Shares, With Age, Value, and Withdrawal Value.

Dayton plan.
Dues 50 cents per share per month.
Dividend, last fiscal year, 6 per cent.
Book value, dues plus dividend.
Withdrawal value, full book value.

No. 2. ALAMEDA.

COLUMBIAN MUTUAL BUILDING AND LOAN ASSOCIATION.

(Incorporated July 18, 1893.)

R. R. READ, Secretary. JAMES K. LYNCH, President.

Fiscal year ended July 31, 1917.

No. of series, 23. No. of members and investors, 258. No. of shares, 2,949.

Assets.		
Loans, on definite contract, $132,984.19; on shares, $4,868.77; on contract sales, $2,931.74		$140,784 70
Arrearages—		
On shares	$1,260 30	
On interest	363 29	
On premium	3 40	
		1,626 99
Cash in bank		14,528 50
Advances, ledger accounts		1,216 95
Other assets, bonds		1,000 00
Total assets		$159,157 14

Liabilities.	
Installment shares, dues	$112,293 60
Installment shares, profits	22,707 55
Advance payments	6,923 26
Overdrafts and bills payable	13,221 56
Reserve and undivided profits	3,231 92
Loans due and incomplete	683 75
All other liabilities, suspense	95 50
Total liabilities	$159,157 14

Receipts for Fiscal Year.	
Balance from last report	$12,804 91
Installment shares, dues	38,582 80
Interest	10,707 17
Fines	77 13
Fees	12 00
Loans repaid	39,050 11
Overdrafts and bills payable	2,378 30
Advances repaid, personal accounts	1,073 47
Total receipts	$104,685 89

Disbursements for Fiscal Year.	
Overdrafts and bills payable	8,178 04
Loans on mortgages and shares	40,252 95
Interest paid	354 36
Dues repaid, installment shares	31,122 58
Profits repaid, installment shares	5,854 28
Advances, personal accounts	978 79
Salaries	1,800 00
Taxes	60 60
Other expenses	555 79
All other disbursements, bonds	1,000 00
Balance, cash in office and bank	14,528 50
Total disbursements	$104,685 89

Installment Shares, With Age, Value, and Withdrawal Value.

Serial No.	Age in months	Total dues per share	Book value per share	Withdrawal value
37	120	$120 00	$166 20	$161 58
39	108	108 00	144 70	141 03
41	96	96 00	124 46	121 61
43	84	84 00	105 40	103 26
45	72	72 00	87 40	85 86
47	60	60 00	70 48	69 23
49	48	48 00	54 50	53 85
51	36	36 00	39 54	39 19
53	24	24 00	25 53	25 38
55	12	12 00	12 38	12 35

No. 3. ANAHEIM.

SAVINGS, LOAN AND BUILDING ASSOCIATION.

(Incorporated January 8, 1887.)

Fred A. Backs, Jr., Secretary. C. F. Grim, President.

Fiscal year ended April 30, 1918.

No. of series, 11. No. of members and investors, 175. No. of shares, 2,529.

Assets.			Liabilities.	
Loans, on mortgages, $100,100; on shares, $10,370		$110,470 00	Installment shares, dues	$75,546 00
Arrearages—			Installment shares, profits	23,105 20
On shares	$1,106 50		Investment notes, principal	19,910 00
On interest	902 85		Advance payments	155 85
On fines	80 45		Overdrafts and bills payable	1,540 00
		2,089 80	Reserve and undivided profits	862 66
Cash in bank		8,505 72	All other liabilities	1 70
Advances, ledger accounts		55 89		
Total assets		$121,121 41	Total liabilities	$121,121 41

Receipts for Fiscal Year.		Disbursements for Fiscal Year.	
Balance from last report	$9,049 71	Overdrafts and bills payable	$9,300 00
Installment shares, dues	15,673 50	Loans on mortgages and shares	17,385 80
Interest	8,353 18	Interest paid	1,620 80
Fines	43 80	Dues repaid, installment shares	13,421 50
Fees	13 50	Profits repaid, installment shares	6,025 58
Loans repaid	16,905 00	Advances, personal accounts	46 45
Overdrafts and bills payable	7,000 00	Salaries	600 00
		Taxes	104 39
		Other expenses	28 45
		Balance, cash in office and bank	8,505 72
Total receipts	$57,038 69	Total disbursements	$57,038 69

Installment Shares, With Age, Value, and Withdrawal Value.

Serial No.	Age in months	Total dues per share	Book value per share	Withdrawal value
20	120	$60 00	$89 69	$85 23
21	108	54 00	77 43	72 74
22	96	48 00	66 07	61 55
23	84	42 00	55 46	51 42
24	72	36 00	45 62	42 25
25	60	30 00	36 50	33 90
26	48	24 00	28 04	26 02
27	36	18 00	20 21	18 88
28	24	12 00	12 96	12 19
29	12	6 00	6 25	6 03

No. 4. BAKERSFIELD.

KERN COUNTY MUTUAL BUILDING AND LOAN ASSOCIATION.

(Incorporated July 29, 1901.)

ARTHUR S. CRITES, Secretary. J. F. DUGAN, President.

Fiscal year ended December 31, 1917.

No. of series, none. No. of members and investors, 407. No. of shares, 11,279.

Assets.		
Loans, on mortgages	$393,140	00
Arrearages, on interest	4,235	47
Cash in bank	18,961	88
Real estate owned	410	16
Advances, ledger accounts	1,192	85
Total assets	$417,940	36

Liabilities.		
Installment shares, dues	$203,614	44
Installment shares, profits	57,580	19
Paid-up and prepaid shares, capital	138,750	00
Reserve and undivided profits	17,009	53
Loans due and incomplete	986	20
Total liabilities	$417,940	36

Receipts for Fiscal Year.		
Balance from last report	$8,591	34
Installment shares, dues	183,912	80
Paid-up and prepaid shares, dues	69,900	00
Interest	40,012	07
Fines	40	62
Loans repaid	112,293	80
Overdrafts and bills payable	40,000	00
Advances repaid, personal accounts	339	35
All other receipts, real estate, etc.	321	20
Total receipts	$455,411	18

Disbursements for Fiscal Year.		
Overdrafts and bills payable	$40,000	00
Loans on mortgages and shares	145,364	55
Interest paid	245	15
Dues repaid, installment shares	185,466	08
Profits repaid, installment shares	42,061	37
Paid-up and prepaid shares, capital	11,100	00
Paid-up and prepaid shares, dividends	7,949	39
Advances, personal accounts	784	95
Salaries	2,556	50
Taxes	279	30
Other expenses	584	33
All other disbursements	57	68
Balance, cash in office and bank	18,961	88
Total disbursements	$455,411	18

Installment Shares, With Age, Value, and Withdrawal Value.

Dayton plan.
Dues 50 cents per share per month.
Dividend, last fiscal year, 10 per cent.
Book value, dues plus dividend.
Withdrawal value, full book value.

No. 5. BAKERSFIELD.

PEOPLES MUTUAL BUILDING AND LOAN ASSOCIATION.

(Incorporated January 27, 1892.)

E. W. SPIERS, Secretary. F. W. ROBINSON, President.

Fiscal year ended January 31, 1918.

No. of series, 16. No. of members and investors, 145. No. of shares, 2,694.

Assets.		
Loans, on mortgages, $145,050.00; on shares, $65		$145,115 00
Arrearages—		
On shares	$507 70	
On interest	682 57	
		1,190 27
Cash in bank		7,811 13
Real estate owned		500 00
Total assets		$154,616 40

Liabilities.	
Installment shares, dues	$61,504 20
Installment shares, profits	23,131 57
Paid-up and prepaid shares, capital	55,800 00
Reserve and undivided profits	13,472 99
Loans due and incomplete	707 64
Total liabilities	$154,616 40

Receipts for Fiscal Year.	
Balance from last report	$16,580 44
Installment shares, dues	19,402 70
Interest	14,806 44
Premiums	95 00
Fines	80 79
Fees	1 50
Loans repaid	53,350 00
Advances repaid, personal accounts	102 50
Total receipts	$104,419 37

Disbursements for Fiscal Year.	
Loans on mortgages and shares	$43,357 36
Dues repaid, installment shares	30,007 50
Profits repaid, installment shares	14,331 17
Paid-up and prepaid shares, capital	3,000 00
Paid-up and prepaid shares, dividends	3,423 00
Salaries	1,800 00
Taxes	99 42
Other expenses	589 79
Balance, cash in office and bank	7,811 13
Total disbursements	$104,419 37

Installment Shares, With Age, Value, and Withdrawal Value.

Serial No.	Age in months	Total dues per share	Book value per share	Withdrawal value
20	96	$57 60	$95 96	$93 50
22	84	50 40	78 96	76 00
24	72	43 20	63 58	60 00
26	60	36 00	49 78	47 00
28	48	28 80	37 36	35 00
30	36	21 60	26 24	25 00
32	24	14 40	16 40	15 50
34	12	7 20	7 70	7 50

No. 6. BERKELEY.

BERKELEY HOME INVESTMENT ASSOCIATION.

(Incorporated December 7, 1908.)

FREDERICK H. CLARK, Secretary. A. E. SHAW, President.

Fiscal year ended March 30, 1918.

No. of series, none. No. of members and investors, 43. No. of shares, 439.

Assets.	
Loans, on mortgages, $10,698.11; on definite contract, $13,858.15; on shares, $350; on contract sales, $34,459.71	$59,365 97
Arrearages, on interest	1 00
Cash, in office, $71.48; in bank, $747.61	819 09
Furniture and fixtures	1 00
Advances, ledger accounts	37 95
Total assets	$60,225 01

Liabilities.	
Guarantee stock, capital	$16,100 00
Guarantee stock, surplus	1,207 50
Installment shares, dues	6,332 86
Installment shares, profits	1,344 35
Paid-up and prepaid shares, capital	2,500 00
Paid-up and prepaid shares, dividends	29 98
Investment certificates, principal	559 50
Investment certificates, dividends	22 18
Overdrafts and bills payable	24,000 00
Reserve and undivided profits	6,564 09
Sundry ledger accounts	61 56
All other liabilities, unpaid dividends, etc.	1,502 99
Total liabilities	$60,225 01

Receipts for Fiscal Year.	
Balance from last report	$793 96
Installment shares, dues	1,810 29
Paid-up and prepaid shares, dues	2,000 00
Investment certificates	1,405 50
Interest	2,205 32
Loans repaid	18,606 68
Overdrafts and bills payable	39,450 00
Advances repaid, personal accounts	270 53
All other receipts, real estate, etc.	38,365 50
Total receipts	$104,907 78

Disbursements for Fiscal Year.	
Overdrafts and bills payable	$15,450 00
Loans on mortgages and shares	51,671 49
Interest paid	318 50
Dues repaid, installment shares	551 00
Profits repaid, installment shares	73 34
Paid-up and prepaid shares, capital	1,500 00
Paid-up and prepaid shares, dividends	101 50
Investment certificates, principal	2,843 30
Investment certificates, dividends	130 77
Advances, personal accounts	386 07
Salaries	1,000 00
Taxes	28 00
Other expenses	736 84
All other disbursements, real estate, etc.	29,297 88
Balance, cash in office and bank	819 09
Total disbursements	$104,907 78

Dayton plan.
Dues 50 cents per share per month.
Dividend, last fiscal year, 6 per cent.
Book value, dues plus dividend.
Withdrawal value, dues plus 6 per cent for average time.

No. 7. CORONA.

CORONA MUTUAL BUILDING AND LOAN ASSOCIATION.

(Incorporated October 2, 1905.)

JOHN P. KEY, Secretary. A. J. WARE, President.

Fiscal year ended September 30, 1917.

No. of series, none. No. of members and investors, 127. No. of shares, 327.

Assets.	
Loans, on mortgages	$42,470 22
Cash, in office, $10; in bank, $1,778.03	1,788 03
Furniture and fixtures	40 00
Advances, ledger accounts	431 83
Other assets	25 00
Total assets	$44,755 08

Liabilities.	
Guarantee stock, capital	$5,000 00
Guarantee stock, surplus	500 00
Installment shares, dues	3,058 99
Installment shares, profits	569 17
Investment certificates, principal	31,327 99
Investment certificates, dividends	1,596 97
Overdrafts and bills payable	2,500 00
Reserve and undivided profits	201 96
Total liabilities	$44,755 08

Receipts for Fiscal Year.	
Balance from last report	$144 82
Installment shares, dues	4,849 63
Investment certificates	26,730 77
Interest	3,865 61
Fines and fees	234 80
Loans repaid	11,837 41
Overdrafts and bills payable	4,030 00
Advances repaid, personal accounts	50 00
Total receipts	$51,743 04

Disbursements for Fiscal Year.	
Overdrafts and bills payable	$13,930 00
Loans on mortgages and shares	12,900 00
Interest paid	662 49
Dividends on guarantee stock	600 00
Dues repaid, installment shares	5,060 64
Profits repaid, installment shares	339 72
Investment certificates, principal	14,308 20
Investment certificates, dividends	593 67
Advances, personal accounts	503 31
Salaries	545 00
Taxes	63 13
Other expenses	408 85
All other disbursements, fixtures, etc.	40 00
Balance, cash in office and bank	1,788 03
Total disbursements	$51,743 04

Dayton plan.
Dues 50 cents per share per month.
Dividend, last fiscal year, 6 per cent.
Book value, dues plus dividend.
Withdrawal value, same as book value.

No. 8. ESCONDIDO.

ESCONDIDO MUTUAL BUILDING AND LOAN ASSOCIATION.

(Reincorporated December 20, 1913.)

L. A. CASSOU, Secretary. H. T. LYON, President.

Fiscal year ended February 28, 1918.

No. of series, 12. No. of members and investors, 50. No. of shares, 454.

Assets.		
Loans, on mortgages		$19,050 00
Arrearages—		
On shares	$219 00	
On interest	130 39	
On premium	20 15	
On fines	21 90	
		391 44
Cash, in office, $38.91; in bank, $842.83		881 74
Real estate owned		421 20
Furniture and fixtures		80 56
Total assets		$20,824 94

Liabilities.	
Installment shares, dues	$17,472 00
Installment shares, profits	2,789 11
Advance payments	60 00
Reserve and undivided profits	489 83
All other liabilities	14 00
Total liabilities	$20,824 94

Receipts for Fiscal Year.	
Balance from last report	$3,825 34
Installment shares, dues	6,112 00
Interest	1,633 23
Premiums	247 95
Fines	18 00
Loans repaid	6,800 00
Total receipts	$18,636 52

Disbursements for Fiscal Year.	
Loans on mortgages and shares	$3,450 00
Dues repaid, installment shares	9,977 00
Profits repaid, installment shares	2,829 04
Advances, personal accounts	721 35
Salaries	204 00
Taxes	51 98
Other expenses	100 21
All other disbursements, real estate	421 20
Balance, cash in office and bank	881 74
Total disbursements	$18,636 52

Installment Shares, With Age, Value, and Withdrawal Value.

Serial No.	Age in months	Total dues per share	Book value per share	Withdrawal value
33	72	$72 00	$91 85	$87 74
35	60	60 00	72 95	69 71
37	48	48 00	55 63	53 72
39	36	36 00	39 95	38 96
41	24	24 00	25 64	25 23
43	12	12 00	12 39	12 30

No. 9. FRESNO.

MUTUAL BUILDING AND LOAN ASSOCIATION.

(Incorporated March 17, 1892.)

WICK W. PARSONS, Secretary. W. T. MATTINGLY, President.

Fiscal year ended February 28, 1918.

No. of series, 18. No. of members and investors, 197. No. of shares, 2,347.

Assets.		
Loans, on definite contract		$127,798 85
Arrearages—		
On shares	$79 30	
On interest	254 26	
		333 56
Cash in office		16,374 19
Other assets, U. S. bonds		3,000 00
Total assets		$147,506 60

Liabilities.	
Installment shares, dues	$95,694 00
Installment shares, profits	38,348 97
Overdrafts and bills payable	10,000 00
Reserve and undivided profits	3,463 63
Total liabilities	$147,506 60

Receipts for Fiscal Year.	
Balance from last report	$6,500 76
Installment shares, dues	18,675 70
Interest	13,431 24
Fines	51 83
Fees	3 50
Loans repaid	50,905 07
Overdrafts and bills payable	24,000 00
Total receipts	$113,568 10

Disbursements for Fiscal Year.	
Overdrafts and bills payable	$34,000 00
Loans on mortgages and shares	19,813 85
Interest paid	1,637 61
Dues repaid, installment shares	22,773 70
Profits repaid, installment shares	14,585 25
Salaries	1,100 00
Taxes	195 64
Other expenses	87 86
All other disbursements, U. S. bonds	3,000 00
Balance, cash in office and bank	16,374 19
Total disbursements	$113,568 10

Installment Shares, With Age, Value, and Withdrawal Value.

Serial No.	Age in months	Total dues per share	Book value per share	Withdrawal value
35	108	$108 00	$172 58	$172 58
37	96	96 00	144 66	144 66
39	84	84 00	119 35	119 35
41	72	72 00	96 61	96 61
43	60	60 00	76 23	76 23
45	48	48 00	57 92	57 92
47	36	36 00	41 34	41 34
49	24	24 00	26 28	26 28
51	12	12 00	12 57	12 57

No. 10. FORTUNA.

FORTUNA BUILDING AND LOAN ASSOCIATION.

(Incorporated April 30, 1889.)

CHAS. A. FRIEDENBACH, Secretary. H. A. NATWICK, President.

Fiscal year ended May 31, 1918.

No. of series, 13. No. of members and investors, 96. No. of shares, 621.

Assets.	
Loans, on mortgages	$22,800 00
Cash in bank	4,271 88
Real estate owned	816 19
Total assets	$27,888 07

Liabilities.	
Installment shares, dues	$23,061 00
Installment shares, profits	3,681 77
Advance payments	30 00
Reserve and undivided profits	1,115 30
Total liabilities	$27,888 07

Receipts for Fiscal Year.	
Balance from last report	$3,049 49
Installment shares, dues	7,492 50
Interest	1,800 05
Fines	6 77
Fees	25 40
Loans repaid	8,000 00
Total receipts	$20,374 21

Disbursements for Fiscal Year.	
Loans on mortgages and shares	$4,500 00
Interest paid	43 55
Dues repaid, installment shares	8,882 50
Profits repaid, installment shares	2,129 47
Salaries	180 00
Other expenses	116 81
All other disbursements, real estate	250 00
Balance, cash in office and bank	4,271 88
Total disbursements	$20,374 21

Installment Shares, With Age, Value, and Withdrawal Value.

Serial No.	Age in months	Total dues per share	Book value per share	Withdrawal value
45	78	$78 00	$98 55	$95 98
46	72	72 00	89 22	87 07
48	60	60 00	71 53	70 09
50	48	48 00	55 06	53 29
52	36	36 00	39 78	38 36
54	24	24 00	25 59	24 79
56	12	12 00	12 38	12 20

No. 11. LIVERMORE.

LIVERMORE MUTUAL BUILDING AND LOAN ASSOCIATION.

(Incorporated September 19, 1906.)

T. E. KNOX, Secretary. J. O. McKOWN, President.

Fiscal year ended September 30, 1917.

No. of series, 13. No. of members and investors, 45. No. of shares, 410.

Assets.	
Loans, on mortgages, $33,055; on shares, $100	$33,155 00
Arrearages, on shares	98 00
Cash in bank	784 96
Total assets	$34,037 96

Liabilities.	
Installment shares, dues	$22,872 00
Installment shares, profits	5,865 79
Advance payments	40 00
Overdrafts and bills payable	4,500 00
Reserve and undivided profits	760 17
Total liabilities	$34,037 96

Receipts for Fiscal Year.	
Balance from last report	$1,165 25
Installment shares, dues	4,836 00
Interest	2,376 83
Fees	6 20
Loans repaid	8,875 00
Overdrafts and bills payable	4,000 00
All other receipts	63 45
Total receipts	$21,322 73

Disbursements for Fiscal Year.	
Overdrafts and bills payable	$4,500 00
Loans on mortgages and shares	8,393 93
Interest paid	339 57
Dues repaid, installment shares	5,605 00
Profits repaid, installment shares	1,192 54
Salaries	200 00
Taxes	290 73
Other expenses	16 00
Balance, cash in office and bank	784 96
Total disbursements	$21,322 73

Installment Shares, With Age, Value, and Withdrawal Value.

Serial No.	Age in months	Total dues per share	Book value per share	Withdrawal value
3	120	$120 00	$164 59	$160 14
6	84	84 00	104 06	102 06
7	78	78 00	95 00	93 38
8	60	60 00	69 83	68 85
9	48	48 00	54 19	53 58
10	36	36 00	39 44	39 10
11	24	24 00	25 52	25 37
13	12	12 00	12 39	12 35

No. 12. LONG BEACH.

MUTUAL BUILDING AND LOAN ASSOCIATION.

(Incorporated August 4, 1904.)

W. S. Stevens, Secretary. E. E. Norton, President.

Fiscal year ended December 31, 1917.

No. of series, none. No. of members and investors, 388. No. of shares, 497.

Assets.	
Loans, on mortgages, $180,572.27; on definite contract, $311,235.96	$418,362 02
Arrearages, on interest	1,845 32
Cash, in office, $2,443.76; in bank, $54,869.72	57,313 49
Furniture and fixtures	500 00
Other assets, U. S. and other bonds	31,037 00
Total assets	$509,057 83

Liabilities.	
Guarantee stock, capital	$40,000 00
Guarantee stock, surplus	4,000 00
Installment shares, dues	11,001 52
Installment shares, profits	3,831 28
Investment certificates, principal	418,399 50
Investment certificates, dividends	25,929 10
Advance payments	43 52
Reserve and undivided profits	4,007 59
All other l'ab'lities, interest delinquent	1,845 32
Total liabilities	$509,057 83

Receipts for Fiscal Year.	
Balance from last report	$47,840 97
Guarantee stock	15,000 00
Installment shares, dues	7,110 87
Investment certificates	284,183 44
Interest	29,612 29
Fees	1,928 20
Loans repaid	58,657 16
Advances repaid, personal accounts	4,418 52
All other receipts, bonds sold, etc.	5,429 73
Total receipts	$454,181 18

Disbursements for Fiscal Year.	
Loans on mortgages and shares	$197,666 10
Interest paid	425 23
Dividends on guarantee stock	2,500 00
Dues repaid, installment shares	21,764 00
Profits repaid, installment shares	8,189 58
Paid-up and prepaid shares, capital	125,987 72
Paid-up and prepaid shares, dividends	9,700 17
Advances, personal accounts	4,375 00
Salaries	2,400 00
Taxes	258 14
Other expenses	2,065 41
All other disbursements, bonds, etc.	21,536 34
Balance, cash in office and bank	57,313 49
Total disbursements	$454,181 18

Installment Shares, With Age, Value, and Withdrawal Value.

Dayton plan.
Dues 50 cents per share per month.
Dividend, last fiscal year, 7 per cent.
Book value, dues plus dividend.
Withdrawal value, same as book value.

No. 13. LOS ANGELES.

BANKERS GUARANTY-LOAN COMPANY.

(Incorporated August 12, 1901.)

G. H. WADLEIGH, Secretary. JOHN H. FOLEY, President.

Fiscal year ended December 31, 1917.

No. of series, none. No. of members and investors, 121. No. of shares, 861.

Assets.	
Loans, on definite contract, $924.34; on shares, $355; on contract sales, $8,592.01	$9,871 35
Cash, in office, $802.39; in bank, $15,845.64	16,648 03
Real estate owned	1,500 00
Advances, ledger accounts	19 50
Total assets	$28,038 88

Liabilities.	
Guarantee stock, capital	$16,138 73
Investment certificates, principal	9,972 76
Investment certificates, dividends	1,912 06
Sundry ledger accounts	15 33
Total liabilities	$28,038 88

Receipts for Fiscal Year.	
Balance from last report	$14,212 30
Investment certificates	789 01
Interest	897 07
Loans repaid	2,973 18
Advances repaid, personal accounts	165 21
All other receipts	91 48
Total receipts	$19,128 25

Disbursements for Fiscal Year.	
Loans on mortgages and shares	$155 00
Interest paid	144 66
Investment certificates, principal	1,713 76
Investment certificates, dividends	98 77
Taxes	53 00
Other expenses	41 75
All other disbursements, real estate, etc.	273 28
Balance, cash in office and bank	16,648 03
Total disbursements	$19,128 25

Installment Shares, With Age, Value, and Withdrawal Value.

Dayton plan.
Dues 60 cents per share per month.
Dividend, last fiscal year, 6 per cent.
Book value, dues plus dividend.
Withdrawal value, same as book value.

No. 14. LOS ANGELES.

FIDELITY SAVINGS AND LOAN ASSOCIATION.

(Incorporated January 31, 1891.)

G. H. WADLEIGH, Secretary. C. C. BOYNTON, President.

Fiscal year ended December 31, 1917.

No. of series, none. No. of members and investors, 6,604. No. of shares, 69,633.

Assets.	
Loans on mortgages, $248,700; on definite contract, $6,674,477.24; on shares, $101,594.15	$7,024,771 39
Arrearages, on interest on stock loans	1,622 88
Cash, in office, $13,345.84; in bank, $76,501.98	89,847 82
Real estate owned	554,869 83
Advances, ledger accounts	163,826 21
Total assets	$7,834,938 13

Liabilities.	
Guarantee stock, capital subscriptions	$220,978 45
Installment shares, dues	1,632,693 52
Installment shares, profits	708,646 66
Paid-up and prepaid shares, capital	2,433,700 00
Paid-up and prepaid shares, dividends	53,859 70
Investment certificates, principal	1,816,583 04
Investment certificates, dividends	40,245 57
Overdrafts and bills payable	3,717 27
Reserve and undivided profits	526,721 99
Loans due and incomplete	147,549 36
Sundry ledger accounts	247,742 57
All other liabilities, tax reserve	2,500 00
Total liabilities	$7,834,938 13

Receipts for Fiscal Year.	
Balance from last report	$282,255 66
Guarantee stock subscriptions	88,942 20
Installment shares, dues	1,006,321 92
Paid-up and prepaid shares, dues	702,950 00
Investment certificates	880,511 45
Interest	548,754 07
Premiums	22,517 46
Fines	3,567 25
Loans repaid	2,953,780 30
Overdrafts and bills payable	3,600 80
All other receipts, real estate, etc.	378,080 12
Total receipts	$6,871,281 23

Disbursements for Fiscal Year.	
Overdrafts and bills payable	$54,070 68
Loans on mortgages and shares	3,402,033 61
Interest paid	3,302 45
Dividends on guarantee stock	11,244 21
Dues repaid, installment shares	1,007,912 33
Profits repaid, installment shares	286,626 72
Paid-up and prepaid shares, capital	103,750 00
Paid-up and prepaid shares, dividends	101,006 45
Investment certificates, principal	878,298 00
Investment certificates, dividends	106,752 82
Advances, personal accounts	241,954 29
Salaries	21,320 00
Taxes	4,339 06
Other expenses	49,839 09
All other disbursements, real estate, etc.	508,983 70
Balance, cash in office and bank	89,847 82
Total disbursements	$6,871,281 23

Installment Shares, With Age, Value, and Withdrawal Value.

	Age in months	Total dues per share	Loan fund dues per share	Book value per share	Withdrawal value
Class "B." Dues 70 cents per share per month.	84	$58 80	$51 12	$85 26	$85 26
	72	50 40	43 46	66 72	66 72
	60	42 00	36 00	50 72	50 72
	48	33 60	28 44	36 97	36 97
	36	25 20	20 88	25 09	25 09
	24	16 80	13 32	14 86	14 86
	12	8 40	5 76	6 01	6 01

No. 15. LOS ANGELES.

HOME INVESTMENT BUILDING AND LOAN ASSOCIATION.

(Incorporated August 21, 1889.)

W. A. Bonynge, Secretary. I. B. Newton, President.

Fiscal year ended September 30, 1917.

No. of series, 17. No. of members and investors, 48. No. of shares, 633.

Assets.		
Loans, on mortgages		$46,800 00
Arrearages—		
On shares	10 00	
On interest	276 42	
		286 42
Cash, in office, $101.25; in bank, $916.17		1,017 42
Furniture and fixtures		75 00
Total assets		$48,178 84

Liabilities.	
Installment shares, dues	$22,692 00
Installment shares, profits	4,160 00
Advance payments	65 00
Overdrafts and bills payable	20,550 00
Reserve and undivided profits	711 84
Total liabilities	$48,178 84

Receipts for Fiscal Year.	
Balance from last report	$381 80
Installment shares, dues	7,474 00
Interest	3,643 39
Fines	15 00
Loans repaid	5,000 00
Overdrafts and bills payable	16,200 00
All other receipts	71 00
Total receipts	$32,785 19

Disbursements for Fiscal Year.	
Overdrafts and bills payable	$19,200 00
Loans on mortgages and shares	5,000 00
Interest paid	1,478 33
Dues repaid, installment shares	4,680 00
Profits repaid, installment shares	751 84
Salaries	425 00
Taxes	175 85
Other expenses	56 75
Balance, cash in office and bank	1,017 42
Total disbursements	$32,785 19

Installment Shares, With Age, Value, and Withdrawal Value.

Serial No.	Age in months	Total dues per share	Book value per share	Withdrawal value
38	114	$114 00	$156 71	$154 57
39	108	108 00	145 82	143 90
41	96	96 00	125 01	122 10
43	84	84 00	105 41	102 19
47	60	60 00	70 08	67 56
49	48	48 00	54 19	52 64
51	36	36 00	39 38	38 53
53	24	24 00	25 47	25 10
55	12	12 00	12 36	12 27

No. 16. LOS ANGELES.

METROPOLITAN LOAN ASSOCIATION.

(Incorporated July 30, 1886.)

S. L. Roland, Secretary. J. W. Montgomery, President.

Fiscal year ended June 30, 1918.

No. of series, 22. No. of members and investors, 205. No. of shares, 3,518.

Assets.		
Loans, on mortgages, $283,250; on shares, $9,545		$292,795 00
Arrearages—		
On shares	$125 00	
On interest	269 00	
		394 00
Cash in bank		28,706 91
Furniture and fixtures		311 32
Advances, ledger accounts		27 65
Total assets		$322,234 88

Liabilities.	
Installment shares, dues	$172,122 00
Installment shares, profits	45,407 66
Paid-up and prepaid shares, capital	23,300 00
Advance payments	612 00
Reserve and undivided profits	11,012 66
Loans due and incomplete	63,022 40
Sundry ledger accounts	6,758 16
Total liabilities	$322,234 88

Receipts for Fiscal Year.	
Balance from last report	$22,743 22
Installment shares, dues	38,211 00
Interest	18,253 40
Fines and fees	124 80
Loans repaid	47,705 00
Advances repaid, personal accounts	6,005 00
All other receipts, commissions, etc.	714 00
Total receipts	$133,756 42

Disbursements for Fiscal Year.	
Loans on mortgages and shares	$41,786 00
Dues repaid, installment shares	41,096 00
Profits repaid, installment shares	13,951 40
Paid-up and prepaid shares, capital	2,000 00
Paid-up and prepaid shares, dividends	1,398 00
Salaries	2,760 00
Taxes	355 92
Other expenses	1,390 87
All other disbursements	311 32
Balance, cash in office and bank	28,706 91
Total disbursements	$133,756 42

Installment Shares, With Age, Value, and Withdrawal Value.

Serial No.	Age in months	Total dues per share	Book value per share	Withdrawal value
35	120	$120 00	$169 56	$159 64
37	108	108 00	147 25	137 43
39	96	96 00	126 55	117 38
41	84	84 00	107 12	99 02
43	72	72 00	88 80	82 08
45	60	60 00	71 53	66 91
47	48	48 00	55 25	51 62
49	36	36 00	39 99	37 99
51	24	24 00	25 74	24 86
53	12	12 00	12 42	12 21

No. 17. LOS ANGELES.

SOUTHERN CALIFORNIA LOAN ASSOCIATION.

(Incorporated March 11, 1887.)

JULIUS H. MARTIN, Secretary. C. E. DONNATIN, President.

Fiscal year ended June 30, 1918.

No. of series, 22. No. of members and investors, 508. No. of shares, 2,213.

Assets.	
Loans, on definite contract	$935,004 00
Arrearages, on shares	387 00
Cash in bank	4,602 97
Real estate owned	6,974 67
Furniture and fixtures	900 00
Other assets, U. S. bonds	2,250 00
Total assets	$950,118 64

Liabilities.	
Guarantee stock, capital	$51,000 00
Guarantee stock, surplus	3,510 00
Installment shares, dues	98,438 00
Installment shares, profits	29,804 12
Investment certificates, principal	731,609 82
Advance payments	382 00
Overdrafts and bills payable	5,000 00
Reserve and undivided profits	22,639 92
Loans due and incomplete	7,734 78
Total liabilities	$950,118 64

Receipts for Fiscal Year.	
Balance from last report	$10,235 32
Installment shares, dues	21,415 00
Investment certificates	128,653 45
Interest	71,724 51
Loans repaid	135,840 00
Overdrafts and bills payable	30,000 00
All other receipts, real estate, etc.	13,004 08
Total receipts	$410,872 36

Disbursements for Fiscal Year.	
Overdrafts and bills payable	$25,000 00
Loans on mortgages and shares	155,318 35
Interest paid	749 17
Dividends on guarantee stock	6,120 00
Dues repaid, installment shares	19,308 00
Profits repaid, installment shares	7,730 11
Investment certificates, principal	120,262 94
Investment certificates, dividends	42,732 05
Salaries	4,573 00
Taxes	3,223 58
Other expenses	3,048 90
All other disbursements, real estate, bonds, etc.	18,203 29
Balance, cash in office and bank	4,602 97
Total disbursements	$410,872 36

Installment Shares, With Age, Value, and Withdrawal Value.

Serial No.	Age in months	Total dues per share	Book value per share	Withdrawal value
39	118	$118 00	$171 64	$171 64
41	106	106 00	148 29	148 29
43	96	96 00	130 11	130 11
45	84	84 00	109 58	103 19
47	72	72 00	90 42	83 05
49	60	60 00	72 51	67 51
51	48	48 00	55 96	52 78
53	36	36 00	40 44	38 66
55	24	24 00	26 00	25 25
57	12	12 00	12 53	12 32

No. 18. LOS ANGELES.

STATE MUTUAL BUILDING AND LOAN ASSOCIATION.

(Incorporated June 20, 1889.)

C. J. WADE, Secretary. W. G. COCHRAN, President.

Fiscal year ended December 31, 1917.

No. of series, none. No. of members and investors, 2,338. No. of shares, 8,186.

Assets.			Liabilities.	
Loans, on mortgages, $577,600; on definite contract, $3,256,096.25; on shares, $21,077.91; on contract sales, $32,932.30		$3,887,706 46	Guarantee stock, capital	$200,000 00
Arrearages—			Guarantee stock, surplus	123,017 74
On interest	$13,815 91		Installment shares, dues	37,320 75
On fines	1,455 45		Installment shares, profits	16,710 70
		15,271 36	Paid-up and prepaid shares, capital	399,925 00
Cash, in office, $13,991; in bank, $99,110.34		113,101 34	Paid-up and prepaid shares, dividends	44,995 20
Real estate owned		17,873 71	Investment certificates, principal	3,207,734 15
Furniture and fixtures		16,667 53	Investment certificates, dividends	102,534 50
Advances, ledger accounts		10,646 63	Advance payments	1,225 80
Other assets, bonds and interest		85,847 95	Reserve and undivided profits	6,451 82
			Loans due and incomplete	5,081 43
			Sundry ledger accounts	2,117 89
Total assets		$4,147,114 98	Total liabilities	$4,147,114 98

Receipts for Fiscal Year.		Disbursements for Fiscal Year.	
Balance from last report	$379,742 33	Loans on mortgages and shares	$1,257,652 64
Installment shares, dues	15,088 60	Dividends on guarantee stock	28,000 00
Paid-up and prepaid shares, dues	79,200 00	Dues repaid, installment shares	56,886 85
Investment certificates	322,227 30	Profits repaid, installment shares	26,979 70
Interest	335,493 20	Paid-up and prepaid shares, capital	2,920 00
Fines	4,488 80	Paid-up and prepaid shares, dividends	32,579 20
Fees	1,832 20	Investment certificates, principal	509,483 55
Loans repaid	1,223,152 35	Investment certificates, dividends	196,095 20
Advances repaid, personal accounts	12,046 67	Advances, personal accounts	12,888 16
All other receipts, real estate, etc.	25,719 41	Salaries	15,900 00
		Taxes	4,338 60
		Other expenses	35,832 00
		All other disbursements, Liberty Bonds, real estate, etc.	106,333 62
		Balance, cash in office and bank	113,101 34
Total receipts	$2,398,990 86	Total disbursements	$2,398,990 86

Installment Shares, With Age, Value, and Withdrawal Value.

Dayton plan.
Dues $1.00 per share per month.
Dividend, last fiscal year, 7½ per cent.
Book value, dues plus dividend.
Withdrawal value, full book value.

No. 19. LOS GATOS.

LOS GATOS BUILDING AND LOAN ASSOCIATION.

(Incorporated April 27, 1889.)

E. G. ANGELL, Secretary. C. F. HAMSHER, President.

Fiscal year ended December 31, 1917.

No. of series, 9. No. of members and investors, 27. No. of shares, 84.

Assets.		
Loans, on mortgages, $5,642.50; on definite contract, $5,738.25		$11,380 75
Arrearages—		
On shares	$98 50	
On interest	103 40	
On premium	44 40	
On fines	22 38	
		268 68
Cash in bank		174 28
Real estate owned		869 51
Total assets		$12,693 22

Liabilities.	
Installment shares, dues	$4,660 50
Installment shares, profits	1,861 76
Paid-up and prepaid shares, capital	600 00
Paid-up and prepaid shares, dividends	42 00
Investment certificates, principal	3,000 00
Overdrafts and bills payable	1,700 00
Reserve and undivided profits	828 96
Total liabilities	$12,693 22

Receipts for Fiscal Year.	
Balance from last report	$14 65
Installment shares, dues	900 00
Paid-up and prepaid shares, dues	600 00
Investment certificates	3,000 00
Interest	682 39
Premiums	188 20
Fines	41 95
Fees	75
Loans repaid	2,929 76
Overdrafts and bills payable	3,700 00
All other receipts, rents	37 50
Total receipts	$12,095 20

Disbursements for Fiscal Year.	
Overdrafts and bills payable	$2,700 00
Loans on mortgages and shares	5,944 60
Interest paid	140 54
Dues repaid, installment shares	1,243 50
Profits repaid, installment shares	520 87
Advances, personal accounts	14 00
Salaries	240 00
Taxes	113 48
Other expenses	96 92
All other disbursements, real estate	907 01
Balance, cash in office and bank	174 28
Total disbursements	$12,095 20

Installment Shares, With Age, Value, and Withdrawal Value.

Serial No.	Age in months	Total dues per share	Book value per share	Withdrawal value
13	128	$128 00	$213 12	
14	116	116 00	184 43	Dues plus profits as per by-laws.
15	104	104 00	158 00	
17	80	80 00	109 97	
18	68	68 00	88 94	
19	56	56 00	69 89	
20	44	44 00	52 34	
21	32	32 00	36 16	
22	20	20 00	21 38	

No. 20. MADERA.

MADERA MUTUAL BUILDING AND LOAN ASSOCIATION.

(Incorporated October 26, 1912.)

E. M. McCardle, Secretary. J. B. High, President.

Fiscal year ended October 31, 1917.

No. of series, none. No. of members and investors, 69. No. of shares, 610.

Assets.			Liabilities.	
Loans, on definite contract		$34,412 21	Installment shares, dues	$31,242 00
Arrearages—			Installment shares, profits	5,265 87
On shares	$240 00		Advance payments	308 71
On interest	63 43		Reserve and undivided profits	321 50
		303 43	Loans due and incomplete	726 50
Cash, in office, $294.25; in bank, $2,654.69		2,948 94		
Other assets, Liberty Bonds		200 00		
Total assets		$37,864 58	Total liabilities	$37,864 58

Receipts for Fiscal Year.		Disbursements for Fiscal Year.	
Balance from last report	$2,332 85	Loans on mortgages and shares	$13,437 37
Installment shares, dues	8,369 00	Dues repaid, installment shares	4,456 00
Interest	3,164 10	Profits repaid, installment shares	469 82
Fees	130 00	Salaries	420 00
Loans repaid	7,999 30	Taxes	41 00
		Other expenses	22 12
		All other disbursements, bonds	200 00
		Balance, cash in office and bank	2,948 94
Total receipts	$21,995 25	Total disbursements	$21,995 25

Installment Shares, With Age, Value, and Withdrawal Value.

Dayton plan.
Dues, $1.00 per share per month.
Dividend, last fiscal year, 6 per cent.
Book value, dues plus dividend.
Withdrawal value, dues plus profits as per by-laws.

No. 21. MERCED.

MERCED MUTUAL BUILDING AND LOAN ASSOCIATION.

(Incorporated June 22, 1891.)

J. H. SIMONSON, Secretary. W. E. LANDRUM, President.

Fiscal year ended June 30, 1918.

No. of series, 11. No. of members and investors, 179. No. of shares, 1,843.

Assets.		
Loans, on mortgages, $132,250; on shares, $1,400		$133,650 00
Arrearages—		
On shares	$632 00	
On interest	802 90	
On fines	133 24	
		1,568 14
Cash in bank		21,626 88
Furniture and fixtures		180 00
Other assets, Liberty Bonds		10,000 00
Total assets		$167,025 02

Liabilities.	
Installment shares, dues	$121,044 00
Installment shares, profits	38,682 61
Advance payments	143 40
Reserve and undivided profits	4,855 01
Loans due and incomplete	2,300 00
Total liabilities	$167,025 02

Receipts for Fiscal Year.	
Balance from last report	$14,672 42
Installment shares, dues	22,941 00
Interest	10,392 54
Fines	48 96
Fees	29 90
Loans repaid	18,500 00
Total receipts	$66,584 82

Disbursements for Fiscal Year.	
Loans on mortgages and shares	$20,550 00
Dues repaid, installment shares	10,562 00
Profits repaid, installment shares	2,890 02
Salaries	750 00
Taxes	174 28
Other expenses	231 64
All other disbursements, Liberty Bonds	9,800 00
Balance, cash in office and bank	21,626 88
Total disbursements	$66,584 82

Installment Shares, With Age, Value, and Withdrawal Value.

Serial No.	Age in months	Total dues per share	Book value per share	Withdrawal value
20	120	$120 00	$173 66	$150 25
21	108	108 00	150 91	132 53
22	96	96 00	129 48	115 40
23	84	84 00	109 30	98 88
24	72	72 00	90 25	82 95
25	60	60 00	72 41	67 63
26	48	48 00	55 75	52 90
27	36	36 00	40 24	38 78
28	24	24 00	25 82	25 25
29	12	12 00	12 44	12 33

No. 22. MILL VALLEY.

TAMALPAIS MUTUAL BUILDING AND LOAN ASSOCIATION.

(Incorporated March 16, 1897.)

PAUL HELMORE, Secretary. N. P. YOST, President.

Fiscal year ended April 30, 1918.

No. of series, 23. No. of members and investors, 115. No. of shares, 1,196.

Assets.		
Loans, on mortgages, $7,300; on definite contract, $34,130.94		$41,430 94
Arrearages—		
On shares	$585 75	
On interest	1,112 29	
On fines	107 37	
		1,805 41
Cash, in office, $4.72; in bank, $888.17		892 89
Real estate owned		6,231 75
Furniture and fixtures		126 75
Advances, ledger accounts		545 55
Other assets		37 37
Total assets		$51,070 66

Liabilities.	
Installment shares, dues	$23,369 70
Installment shares, profits	4,167 88
Paid-up and prepaid shares, capital	20,300 00
Advance payments	54 75
Overdrafts and bills payable	2,000 00
Reserve and undivided profits	1,012 07
Sundry ledger accounts	166 26
Total liabilities	$51,070 66

Receipts for Fiscal Year.	
Balance from last report	$1,916 84
Installment shares, dues	7,257 25
Paid-up and prepaid shares, dues	3,200 00
Interest	3,965 39
Fines	162 25
Fees	7 00
Loans repaid	12,219 37
Overdrafts and bills payable	3,000 00
Advances repaid, personal accounts	1,214 27
Total receipts	$32,942 37

Disbursements for Fiscal Year.	
Overdrafts and bills payable	$1,000 00
Loans on mortgages and shares	9,000 00
Interest paid	373 77
Dues repaid, installment shares	10,281 15
Profits repaid, installment shares	2,152 09
Paid-up and prepaid shares, capital	3,100 00
Paid-up and prepaid shares, dividends	1,259 75
Advances, personal accounts	1,940 00
Salaries	600 00
Taxes	180 59
Other expenses	230 93
All other disbursements, real estate	1,931 20
Balance, cash in office and bank	892 89
Total disbursements	$32,942 37

Installment Shares, With Age, Value, and Withdrawal Value.

Serial No.	Age in months	Total dues per share	Book value per share	Withdrawal value
49	72	$72 00	$90 34	
53	60	60 00	72 07	Dues plus profits as per by-laws.
57	48	48 00	55 24	
61	36	36 00	39 73	
65	24	24 00	25 48	
69	12	12 00	12 36	

No. 23. NAPA.

NAPA BUILDING AND LOAN ASSOCIATION.

(Incorporated September 8, 1888.)

JOHN N. MOUNT, Secretary. E. D. BEARD, President.

Fiscal year ended May 31, 1918.

No. of series, 12. No. of members and investors, 403. No. of shares, 3,950.

Assets.

Loans, on mortgages, $251,674.27; on shares, $10,670; on contract sales, $2,120.20		$264,464 47
Arrearages—		
On shares	$248 00	
On interest	261 46	
On fines	62 75	
		572 21
Cash in bank		2,703 51
Furniture and fixtures		150 00
Advances, ledger accounts		75 33
Other assets, Liberty Bonds		2,500 00
Total assets		$270,465 52

Liabilities.

Installment shares, dues	$216,082 00
Installment shares, profits	50,743 84
Advance payments	1,008 00
Reserve and undivided profits	2,631 68
Total liabilities	$270,465 52

Receipts for Fiscal Year.

Balance from last report	$14,481 81
Installment shares, dues	47,231 00
Interest	17,225 62
Premiums	15 11
Fines and fees	436 77
Loans repaid	38,165 09
All other receipts	23 29
Total receipts	$117,578 69

Disbursements for Fiscal Year.

Loans on mortgages and shares	$57,152 79
Dues repaid, installment shares	39,273 00
Profits repaid, installment shares	13,921 07
Advances, personal accounts	75 33
Salaries	1,234 00
Taxes	239 07
Other expenses	479 92
All other disbursements, Liberty Bonds	2,500 00
Balance, cash in office and bank	2,703 51
Total disbursements	$117,578 69

Installment Shares, With Age, Value, and Withdrawal Value.

Serial No.	Age in months	Total dues per share	Book value per share	Withdrawal value
23	125	$125 00	$176 58	$157 55
24	113	113 00	153 99	139 60
25	101	101 00	132 99	122 25
26	89	89 00	113 27	105 50
27	77	77 00	94 73	89 35
28	65	65 00	77 33	73 80
29	53	53 00	60 97	58 85
30	41	41 00	45 65	44 50
31	29	29 00	31 26	30 75
32	17	17 00	17 77	17 46

No. 24. NEWCASTLE.

NEWCASTLE BUILDING AND LOAN ASSOCIATION.

(Incorporated May 20, 1889.)

JOHN WALLACE, Secretary. GEO. W. BISBEE, President.

Fiscal year ended April 30, 1918.

No. of series, 11. No. of members and investors, 89. No. of shares, 658.

Assets.		
Loans, on mortgages, $54,150; on shares, $1,000		$55,150 00
Arrearages—		
On shares	$15 00	
On fines	75	
		15 75
Cash, in office, $38.96; in bank, $2,446.58		2,485 54
Real estate owned		1,473 53
Furniture and fixtures		50 00
Other assets, Liberty Bonds		350 00
Total assets		$59,524 82

Liabilities.	
Installment shares, dues	$45,468 00
Installment shares, profits	12,041 08
Advance payments	57 23
Reserve and undivided profits	1,885 01
Sundry ledger accounts	73 50
Total liabilities	$59,524 82

Receipts for Fiscal Year.	
Balance from last report	$889 97
Installment shares, dues	8,155 00
Interest	4,279 86
Fines	10 65
Fees	4 50
Loans repaid	2,750 00
Overdrafts and bills payable	3,775 52
All other receipts	61 34
Total receipts	$19,926 84

Disbursements for Fiscal Year.	
Overdrafts and bills payable	$3,775 52
Loans on mortgages and shares	5,800 00
Interest paid	47 31
Dues repaid, installment shares	5,044 00
Profits repaid, installment shares	1,770 82
Salaries	417 50
Taxes	134 06
Other expenses	92 09
All other disbursements, bonds, etc.	360 00
Balance, cash in office and bank	2,485 54
Total disbursements	$19,926 84

Installment Shares, With Age, Value, and Withdrawal Value.

Serial No.	Age in months	Total dues per share	Book value per share	Withdrawal value
20	120	$120 00	$165 62	
21	108	108 00	144 37	Dues plus profits as per by-laws.
22	96	96 00	124 37	
23	84	84 00	105 42	
24	72	72 00	87 55	
25	60	60 00	70 71	
26	48	48 00	54 80	
27	36	36 00	39 80	
28	24	24 00	25 69	
29	12	12 00	12 43	

No. 25. OAKLAND.

ALAMEDA COUNTY LOAN ASSOCIATION.

(Incorporated July 20, 1875.)

CHAS. P. HOAG, Secretary. J. B. RICHARDSON, President.

Fiscal year ended June 30, 1918.

No. of series, none. No. of members and investors, 603. No. of shares, 3,306.

Assets.	
Loans, on definite contract, $432,075.93; on shares, $1,200; on contract sales, $20,835.91	$454,111 84
Arrearages, on interest	1,186 74
Cash, in office, $200; in bank, $8,476.27	8,676 27
Real estate owned, office bldg., $57,396.82	79,525 23
Furniture and fixtures	400 00
Advances, ledger accounts	42 59
Other assets, Liberty Bonds	2,500 00
Total assets	$546,442 67

Liabilities.	
Installment shares, dues	$194,597 72
Installment shares, profits	47,857 25
Paid-up and prepaid shares, capital	52,492 37
Paid-up and prepaid shares, dividends	10,564 86
Investment certificates, principal	170,921 93
Investment certificates, dividends	10,952 71
Advance payments	26 50
Overdrafts and bills payable	14,000 00
Reserve and undivided profits	31,067 04
Loans due and incomplete	13,244 21
Sundry ledger accounts	210 40
All other liabilities	507 68
Total liabilities	$546,442 67

Receipts for Fiscal Year.	
Balance from last report	$39,425 13
Installment shares, dues	42,141 74
Paid-up and prepaid shares, dues	9,525 93
Investment certificates	23,569 72
Interest	36,191 98
Loans repaid	155,302 10
Overdrafts and bills payable	54,000 00
Advances repaid, personal accounts	866 34
All other receipts, real estate, etc.	29,536 85
Total receipts	$390,559 79

Disbursements for Fiscal Year.	
Overdrafts and bills payable	$40,000 00
Loans on mortgages and shares	177,672 91
Interest paid	566 20
Dues repaid, installment shares	52,349 64
Profits repaid, installment shares	11,058 93
Paid-up and prepaid shares, capital	6,817 00
Paid-up and prepaid shares, dividends	1,232 37
Investment certificates, principal	39,125 14
Investment certificates, dividends	16,726 26
Advances, personal accounts	1,327 28
Salaries	3,985 00
Taxes	476 15
Other expenses	3,205 76
All other disbursements	27,340 88
Balance, cash in office and bank	8,676 27
Total disbursements	$390,559 79

Installment Shares, With Age, Value, and Withdrawal Value.

Dayton plan.
Dues, $1.00 per share per month.
Dividend, last fiscal year, 6 per cent.
Book value, dues plus dividend.
Withdrawal value, full book value.

No. 26. OAKLAND.

COSMOPOLITAN MUTUAL BUILDING AND LOAN ASSOCIATION.

(Incorporated August 4, 1879.)

W. S. GOULD, Secretary. WM. H. HIGH, President.

Fiscal year ended July 31, 1917.

No. of series, 23. No. of members and investors, 304. No. of shares, 2,131.

Assets.		
Loans on definite contract, $118,431.62; on shares, $6,735.16		$125,166 78
Arrearages—		
On shares	$1,236 36	
On interest	851 39	
		2,087 75
Cash, in office, $1,846.02; in bank, $3,266.77		5,112 79
Real estate owned		20,142 50
Furniture and fixtures		500 00
Advances, ledger accounts		206 62
Other assets		280 65
Total assets		$153,497 09

Liabilities.	
Installment shares, dues	$78,683 30
Installment shares, profits	16,507 23
Paid-up and prepaid shares, capital	10,900 00
Investment certificates, principal	20,452 96
Advance payments	11,111 07
Overdrafts and bills payable	10,900 00
Reserve and undivided profits	4,155 72
Loans due and incomplete	276 79
Sundry ledger accounts	510 02
Total liabilities	$153,497 09

Receipts for Fiscal Year.	
Balance from last report	$3,760 95
Installment shares, dues	27,507 83
Paid-up and prepaid shares, dues	6,650 00
Investment certificates	12,525 84
Interest	11,674 14
Fines	59 54
Loans repaid	71,956 39
Overdrafts and bills payable	24,278 62
Advances repaid, personal accounts	4,260 93
All other receipts, real estate, etc.	6,463 89
Total receipts	$169,138 13

Disbursements for Fiscal Year.	
Overdrafts and bills payable	$36,878 62
Loans on mortgages and shares	51,018 65
Interest paid	3,101 16
Dues repaid, installment shares	29,923 73
Profits repaid, installment shares	5,011 67
Paid-up and prepaid shares, capital	2,500 00
Paid-up and prepaid shares, dividends	529 50
Investment certificates, principal	10,719 55
Advances, personal accounts	3,212 03
Salaries	2,550 00
Taxes	539 66
Other expenses	811 12
All other disbursements, real estate, etc.	17,229 65
Balance, cash in office and bank	5,112 79
Total disbursements	$169,138 13

Installment Shares, With Age, Value, and Withdrawal Value.

Serial No.	Age in months	Total dues per share	Book value per share	Withdrawal value
58	120	$120 00	$160 72	$158 69
60	108	108 00	140 19	136 98
62	96	96 00	120 73	114 58
64	84	84 00	102 39	95 96
66	72	72 00	85 09	79 20
68	60	60 00	68 81	66 60
70	48	48 00	53 54	53 32
72	36	36 00	39 10	38 91
74	24	24 00	25 37	25 26
76	12	12 00	12 36	12 31

No. 27. ONTARIO.

PEOPLES MUTUAL BUILDING AND LOAN ASSOCIATION.

(Incorporated June 24, 1891.)

J. O. Henderson, Secretary. A. P. Harwood, President.

Fiscal year ended December 31, 1917.

No. of series, none. No. of members and investors, 710. No. of shares, 11,912.

Assets.

Loans, on mortgages, $542,500; on shares, $6,863.33		$549,363 33
Arrearages—		
On interest	$5,625 84	
On fines and fees	709 40	
		6,335 24
Cash in bank		10,889 73
Real estate owned		8,732 17
Furniture and fixtures		1,601 60
Advances, ledger accounts		633 32
Other assets, Liberty Bonds		2,600 00
Total assets		$580,155 39

Liabilities.

Installment shares, dues	$196,243 43
Installment shares, profits	53,720 22
Paid-up and prepaid shares, capital	283,800 00
Paid-up and prepaid shares, dividends	8,122 10
Overdrafts and bills payable	14,724 61
Reserve and undivided profits	17,206 76
Loans due and incomplete	5,752 31
Sundry ledger accounts	585 96
Total liabilities	$580,155 39

Receipts for Fiscal Year.

Balance from last report	$13,670 11
Installment shares, dues	95,475 04
Paid-up and prepaid shares, dues	53,775 00
Interest	39,292 90
Fines	681 00
Fees	45 70
Loans repaid	132,188 27
Overdrafts and bills payable	5,030 63
Advances repaid, personal accounts	3,525 45
All other receipts	480 00
Total receipts	$344,164 10

Disbursements for Fiscal Year.

Overdrafts and bills payable	$8,986 37
Loans on mortgages and shares	131,387 92
Interest paid	937 58
Dues repaid, installment shares	106,850 88
Profits repaid, installment shares	21,501 45
Paid-up and prepaid shares, capital	36,025 00
Paid-up and prepaid shares, dividends	16,471 95
Advances, personal accounts	2,315 41
Salaries	2,850 00
Taxes	614 32
Other expenses	973 34
All other disbursements, Liberty Bonds, etc.	4,360 15
Balance, cash in office and bank	10,889 73
Total disbursements	$344,164 11

Installment Shares, With Age, Value, and Withdrawal Value.

Dayton plan.
Dues, 60 cents per share per month.
Dividend, last fiscal year, 7.25 per cent.
Book value, dues plus dividend.
Withdrawal value, dues plus profits, as per by-laws.

No. 28. ORANGE.

ORANGE BUILDING AND LOAN ASSOCIATION.

(Incorporated September 21, 1887.)

Osman Pixley, Secretary. D. C. Pixley, President.

Fiscal year ended October 31, 1917.

No. of series, 22. No. of members and investors, 596. No. of shares, 4,915.

Assets.		
Loans, on mortgages, $369,300; on definite contract, $173,065.51; on shares, $1,805; on contract sales, $3,489.53		$547,660 04
Arrearages—		
On shares	$1,797 50	
On interest	5,507 50	
On fines	637 07	
		7,942 07
Cash, in office, $233.03; in bank, $18,055.80		18,288 83
Real estate owned		10,995 17
Furniture and fixtures		607 65
Advances, ledger accounts		161 42
Other assets, Liberty Bonds		1,000 00
Total assets		$586,655 18

Liabilities.	
Guarantee stock, capital	$25,000 00
Guarantee stock, surplus and dividends	13,000 00
Installment shares, dues	187,977 00
Installment shares, profits	56,480 12
Paid-up and prepaid shares, capital	272,350 00
Paid-up and prepaid shares, dividends	5,450 83
Advance payments	241 70
Overdrafts and bills payable	10,000 00
Reserve and undivided profits	13,974 45
Loans due and incomplete	1,173 88
Sundry ledger accounts	61 38
All other liabilities	945 82
Total liabilities	$586,655 18

Receipts for Fiscal Year.	
Balance from last report	$17,819 25
Installment shares, dues	46,856 00
Paid-up and prepaid shares, dues	61,100 00
Interest	45,435 47
Fines	1,092 13
Fees	50 95
Loans repaid	162,125 98
Overdrafts and bills payable	1,900 00
Advances repaid, personal accounts	1,401 10
All other receipts, real estate, etc.	686 62
Total receipts	$338,467 50

Disbursements for Fiscal Year.	
Overdrafts and bills payable	$1,900 00
Loans on mortgages and shares	133,029 29
Interest paid	17 70
Dividends on guarantee stock	3,750 00
Dues repaid, installment shares	81,363 75
Profits repaid, installment shares	34,850 81
Paid-up and prepaid shares, capital	38,200 00
Paid-up and prepaid shares, dividends	14,900 61
Advances, personal accounts	1,290 49
Salaries	2,453 00
Taxes	730 69
Other expenses	737 96
All other disbursements, real estate, etc.	6,954 37
Balance, cash in office and bank	18,288 83
Total disbursements	$338,467 50

Installment Shares, With Age, Value, and Withdrawal Value.

Serial No.	Age in months	Total dues per share	Book value per share	Withdrawal value
16	120	$120 00	$186 16	$186 16
18	108	108 00	160 01	160 01
20	96	96 00	135 91	135 91
22	84	84 00	113 69	113 69
24	72	72 00	93 25	87 94
26	60	60 00	74 38	70 78
28	48	48 00	56 99	54 74
30	36	36 00	40 94	39 70
32	24	24 00	26 17	25 08
34	12	12 00	12 55	12 27

No. 29. PALO ALTO.

PALO ALTO MUTUAL BUILDING AND LOAN ASSOCIATION.

(Incorporated November 14, 1892.)

EDWARD JESURUN, Secretary. A. B. CLARK, President.

Fiscal year ended September 30, 1917.

No. of series, none. No. of members and investors, 410. No. of shares, 1,993.

Assets.	
Loans, on definite contract, $450,176.24; on shares, $3,700.00	$453,876 24
Arrearages, on rents	7 00
Cash, in office, $200; in bank, $7,467.28	7,667 28
Real estate owned	69,008 03
Furniture and fixtures	2,135 68
Advances, ledger accounts	635 25
Other assets, street bonds, etc.	1,621 71
Total assets	$534,951 19

Liabilities.	
Guarantee stock, capital	$30,750 00
Guarantee stock, surplus and dividends	1,846 25
Installment shares, dues	67,782 20
Installment shares, profits	26,041 80
Paid-up and prepaid shares, capital	33,123 58
Paid-up and prepaid shares, dividends	593 39
Investment certificates, principal	345,438 17
Investment certificates, dividends	1,167 40
Reserve and undivided profits	10,237 27
Loans due and incomplete	9,619 78
Sundry ledger accounts	4,139 26
All other liabilities, contingent and tax reserve	4,212 09
Total liabilities	$534,951 19

Receipts for Fiscal Year.	
Balance from last report	$8,222 90
Installment shares, dues	15,712 40
Paid-up and prepaid shares, dues	2,424 72
Investment certificates	152,033 04
Interest	38,719 02
Loans repaid	138,747 72
Overdrafts and bills payable	10,000 00
Advances repaid, personal accounts	17,775 05
All other receipts, rents, real estate, etc.	2,477 79
Total receipts	$386,112 64

Disbursements for Fiscal Year.	
Overdrafts and bills payable	$10,000 00
Loans on mortgages and shares	136,219 87
Interest paid	29 17
Dividends on guarantee stock	2,152 50
Dues repaid, installment shares	17,104 45
Profits repaid, installment shares	3,197 50
Paid-up and prepaid shares, capital	5,325 00
Paid-up and prepaid shares, dividends	2,082 68
Investment certificates, principal	143,513 11
Investment certificates, dividends	19,182 63
Advances, personal accounts	9,734 16
Salaries	2,820 00
Taxes	1,768 52
Other expenses	1,502 82
All other disbursements, real estate, etc.	23,812 95
Balance, cash in office and bank	7,667 28
Total disbursements	$386,112 64

Installment Shares, With Age, Value, and Withdrawal Value.

Dayton plan.
Dues, $1.00 per share per month.
Dividend, last fiscal year, 6 per cent.
Book value, dues plus dividend.
Withdrawal value, dues plus profits as per by-laws.

No. 30. PASADENA.

CALIFORNIA SECURITY LOAN CORPORATION.

(Incorporated March 22, 1809.)

A. J. Morris, Secretary. A. W. Byrne, President.

Fiscal year ended December 31, 1917.

No. of series, none. No. of members and investors, 926. No. of shares, 1,000.

Assets.	
Loans, on mortgages, $227,710.55; on definite contract, $606,348.83; on shares, $2,870; on contract sales, $13,721.98	$950,651 36
Arrearages, on interest	6,288 40
Cash, in office, $14,473.09; in bank, $10,971.58	25,444 67
Real estate owned (office bldg., $48,561.13)	63,552 22
Furniture and fixtures	2,621 01
Advances, ledger accounts	52 20
Other assets, Liberty Bonds and interest	7,446 00
Total assets	$1,056,055 86

Liabilities.	
Guarantee stock, capital	$100,000 00
Guarantee stock, surplus and dividends	3,000 00
Investment certificates, principal	877,292 31
Investment certificates, dividends	4,844 00
Advance payments	879 82
Overdrafts and bills payable	51,000 00
Reserve and undivided profits	12,129 97
Loans due and incomplete	3,703 93
Sundry ledger accounts	333 83
All other liabilities, escrows	2,872 00
Total liabilities	$1,056,055 86

Receipts for Fiscal Year.	
Balance from last report	$26,793 83
Investment certificates	425,991 58
Interest	78,958 42
Premiums	1,933 58
Fines	389 65
Loans repaid	397,162 46
Overdrafts and bills payable	91,000 00
Advances repaid, personal accounts	33,118 48
All other receipts, real estate, etc.	5,170 90
Total receipts	$1,060,518 90

Disbursements for Fiscal Year.	
Overdrafts and bills payable	$40,000 00
Loans on mortgages and shares	485,913 10
Interest paid	484 63
Dividends on guarantee stock	3,000 00
Investment certificates, principal	373,796 78
Investment certificates, dividends	51,435 03
Advances, personal accounts	28,700 04
Salaries	11,085 00
Taxes	1,147 12
Other expenses	5,389 69
All other disbursements, real estate, bonds, etc.	34,122 84
Balance, cash in office and bank	25,444 67
Total disbursements	$1,060,518 90

Installment Shares, With Age, Value, and Withdrawal Value.

Dayton plan.
Dues, 60 cents per share per month.
Dividend, last fiscal year, 6 per cent.
Book value, dues plus dividend.
Withdrawal value, full book value.

No. 31. PASADENA.

PASADENA BUILDING AND LOAN ASSOCIATION.

(Incorporated February 7, 1899.)

Everett D. Hill, Secretary. Solon Briggs, President.

Fiscal year ended December 31, 1917.

No. of series, none. No. of members and investors, 560. No. of shares, 2,548.

Assets.	
Loans, on mortgages, $87,998.53; on definite contract, $119,648.85; on shares, $615	$208,262 38
Arrearages, on interest	4,356 23
Cash, in office, $2,250.15; in bank, $33,287.08	35,537 23
Advances, ledger accounts	211 11
Other assets	28 00
Total assets	$248,394 95

Liabilities.	
Guarantee stock, capital	$9,000 00
Guarantee stock, surplus	1,585 83
Installment shares, dues	24,116 03
Installment shares, profits	27,543 38
Paid-up and prepaid shares, capital	20,200 00
Paid-up and prepaid shares, dividends	152 00
Investment certificates, principal	148,420 19
Investment certificates, dividends	5,085 39
Reserve and undivided profits	5,866 23
Loans due and incomplete	5,742 10
Sundry ledger accounts	143 80
All other liabilities, guarantee dividends unpaid	540 00
Total liabilities	$248,394 95

Receipts for Fiscal Year.	
Balance from last report	$27,101 01
Installment shares, dues	15,952 97
Paid-up and prepaid shares, dues	15,400 00
Investment certificates	85,301 79
Interest	14,439 37
Loans repaid	24,790 12
Total receipts	$182,985 26

Disbursements for Fiscal Year.	
Loans on mortgages and shares	$81,909 50
Dividends on guarantee stock	1,080 00
Dues repaid, installment shares	9,379 38
Profits repaid, installment shares	1,973 68
Paid-up and prepaid shares, capital	6,500 00
Paid-up and prepaid shares, dividends	371 75
Investment certificates, principal	36,888 76
Investment certificates, dividends	5,852 98
Advances, personal accounts	150 36
Salaries	1,992 00
Taxes	122 50
Other expenses	1,227 12
Balance, cash in office and bank	35,537 23
Total disbursements	$182,985 26

Installment Shares, With Age, Value, and Withdrawal Value.

Dayton plan.
Dues 50 cents per share per month.
Dividend, last fiscal year, 6 per cent.
Book value, dues plus dividend.
Withdrawal value, full book value.

No. 32. PASO ROBLES.

PASO ROBLES MUTUAL BUILDING AND LOAN ASSOCIATION.

(Incorporated September 8, 1905.)

F. G. WETZEL, Secretary. B. J. DOUGHERTY, President.

Fiscal year ended August 31, 1917.

No. of series, 9. No. of members and investors, 61. No. of shares, 269.

Assets.		Liabilities.	
Loans, on mortgages, $2,000; on definite contract, $23,694.90; on shares, $825	$26,519 90	Installment shares, dues	$6,406 80
Cash, in office, $25; in bank, $621.97	646 97	Installment shares, profits	1,823 00
Furniture and fixtures	156 55	Paid-up and prepaid shares, capital	1,500 00
Advances, ledger accounts	75 00	Investment certificates, principal	13,250 00
		Reserve and undivided profits	4,418 62
Total assets	$27,398 42	Total liabilities	$27,398 42

Receipts for Fiscal Year.		Disbursements for Fiscal Year.	
Balance from last report	$4,557 76	Overdrafts and bills payable	$3,600 00
Installment shares, dues	1,827 60	Loans on mortgages and shares	11,535 10
Investment certificates	1,275 00	Interest paid	502 67
Interest	2,733 10	Dues repaid, installment shares	10,561 80
Fines	34 37	Profits repaid, installment shares	2,715 46
Fees	5 35	Paid-up and prepaid shares, dividends	83 00
Loans repaid	17,426 96	Investment certificates, principal	600 00
Overdrafts and bills payable	3,600 00	Investment certificates, dividends	559 00
		Salaries	511 00
		Taxes	73 21
		Other expenses	71 93
		Balance, cash in office and bank	646 97
Total receipts	$31,460 14	Total disbursements	$31,460 14

Installment Shares, With Age, Value, and Withdrawal Value.

Serial No.	Age in months	Total dues per share	Book value per share	Withdrawal value
3	129	$129 00	$194 12	$190 86
6	117	117 00	169 59	166 96
10	99	99 00	135 05	133 31
14	81	81 00	103 21	100 99
16	72	72 00	89 70	87 93
18	48	48 00	55 99	53 99
19	45	45 00	52 10	50 33
20	24	24 00	26 16	25 62
22	12	12 00	12 59	12 44

No. 33. PETALUMA.

PETALUMA MUTUAL LOAN ASSOCIATION.

(Incorporated September 27, 1889.)

F. A. CROMWELL, Secretary. F. H. DENMAN, President.

Fiscal year ended September 30, 1917.

No. of series, 12. No. of members and investors, 85. No. of shares, 728.

Assets.		
Loans, on mortgages, $38,497.28; on shares, $1,875		$40,372 28
Arrearages—		
On shares	$222 00	
On interest	236 40	
On fines	18 60	
		477 00
Cash in bank		9,965 06
Real estate owned		3,410 00
Furniture and fixtures		30 00
Total assets		$54,254 34

Liabilities.	
Installment shares, dues	$44,388 00
Installment shares, profits	8,756 14
Reserve and undivided profits	1,110 20
Total liabilities	$54,254 34

Receipts for Fiscal Year.	
Balance from last report	$3,151 44
Installment shares, dues	9,439 00
Interest	3,256 37
Fines	42 40
Loans repaid	10,425 00
Overdrafts and bills payable	3,000 00
Total receipts	$29,314 21

Disbursements for Fiscal Year.	
Overdrafts and bills payable	$3,000 00
Loans on mortgages and shares	5,408 36
Interest paid	75 00
Dues repaid, installment shares	7,627 00
Profits repaid, installment shares	1,530 86
Salaries	420 00
Taxes	163 05
Other expenses	49 25
All other disbursements, real estate, etc.	1,075 63
Balance, cash in office and bank	9,965 06
Total disbursements	$29,314 21

Installment Shares, With Age, Value, and Withdrawal Value.

Serial No.	Age in months	Total dues per share	Book value per share	Withdrawal value
20	120	$120 00	$156 51	$156 51
21	108	108 00	136 69	136 69
22	96	96 00	118 03	117 48
23	84	84 00	100 35	99 53
24	72	72 00	83 66	82 79
25	60	60 00	67 85	67 06
26	48	48 00	52 85	52 12
27	36	36 00	38 63	38 10
28	24	24 00	25 15	24 86
29	12	12 00	12 30	12 21

No. 34. PLEASANTON.

PLEASANTON MUTUAL BUILDING AND LOAN ASSOCIATION.

(Incorporated March 1, 1895.)

T. H. SILVER, Secretary. C. LETHAM, President.

Fiscal year ended March 27, 1918.

No. of series, 20. No. of members and investors, 41. No. of shares, 270.

Assets.		
Loans, on mortgages		$20,550 00
Arrearages—		
On shares	$140 00	
On interest	165 60	
		305 60
Cash in bank		2,106 77
Total assets		$22,962 37

Liabilities.	
Installment shares, dues	$16,560 00
Installment shares, profits	4,192 10
Reserve and undivided profits	2,210 27
Total liabilities	$22,962 37

Receipts for Fiscal Year.	
Balance from last report	$1,211 27
Installment shares, dues	3,371 00
Interest	1,519 70
Fees	17 50
Loans repaid	4,600 00
Advances repaid, personal accounts	172 00
Total receipts	$10,891 47

Disbursements for Fiscal Year.	
Loans on mortgages and shares	$2,850 00
Dues repaid, installment shares	4,109 00
Profits repaid, installment shares	1,282 60
Advances, personal accounts	305 60
Salaries	150 00
Taxes	45 00
Other expenses	42 50
Balance, cash in office and bank	2,106 77
Total disbursements	$10,891 47

Installment Shares, With Age, Value, and Withdrawal Value.

Serial No.	Age in months	Total dues per share	Book value per share	Withdrawal value
24	132	$132 00	$188 40	
28	108	108 00	144 30	Dues plus 90 per cent of profits.
30	96	96 00	124 20	
32	84	84 00	105 05	
34	72	72 00	87 25	
36	60	60 00	70 50	
38	48	48 00	54 45	
40	36	36 00	39 60	
42	24	24 00	25 60	
44	12	12 00	12 40	

No. 35. POMONA.

HOME-BUILDERS LOAN ASSOCIATION.

(Incorporated March 16, 1908.)

C. E. GREASER, Secretary. J. W. FULTON, President.

Fiscal year ended March 31, 1918.

No. of series, none. No. of members and investors, 839. No. of shares, 3253.

Assets.		
Loans, on definite contract, $666,451.67; on shares, $6,297.53	$672,749	20
Cash, in office, $789.12; in bank, $15,234.12	16,023	34
Real estate owned (office bldg., $15,000)	42,781	87
Furniture and fixtures	655	06
Advances, ledger accounts	2,078	67
Other assets, Gov't bonds	2,500	00
Total assets	$736,788	14

Liabilities.		
Guarantee stock, capital	$100,000	00
Guarantee stock, surplus, $15,000; dividends, $6,000	21,000	00
Installment shares, dues	63,281	75
Installment shares, profits	24,636	13
Investment certificates, principal	481,334	66
Investment certificates, dividends	7,296	52
Overdrafts and bills payable	20,000	00
Reserve and undivided profits	1,085	85
Loans due and incomplete	10,364	73
Sundry ledger accounts	1,176	00
All other liabilities, unearned bonus	6,612	50
Total liabilities	$736,788	14

Receipts for Fiscal Year.		
Balance from last report	$13,131	32
Installment shares, dues	15,429	50
Investment certificates	287,983	70
Interest	66,775	61
Fines	535	81
Fees	277	00
Loans repaid	160,337	49
Overdrafts and bills payable	30,000	00
Advances repaid, personal accounts	8,238	09
All other receipts, real estate, etc.	18,764	90
Total receipts	$601,473	42

Disbursements for Fiscal Year.		
Overdrafts and bills payable	$55,000	00
Loans on mortgages and shares	230,694	45
Interest paid	1,347	21
Dividends on guarantee stock	11,000	00
Dues repaid, installment shares	7,574	50
Profits repaid, installment shares	2,548	39
Investment certificates, principal	208,530	39
Investment certificates, dividends	25,778	50
Advances, personal accounts	7,914	65
Salaries	4,865	00
Taxes	807	45
Other expenses	4,116	87
All other disbursements, real estate, etc.	25,272	67
Balance, cash in office and bank	16,023	34
Total disbursements	$601,473	42

Installment Shares, With Age, Value, and Withdrawal Value.

Dayton plan.
Dues 50 cents per share per month.
Dividend, last fiscal year, 10 per cent.
Book value, dues plus dividend.
Withdrawal value, full book value.

No. 36. POMONA.

MUTUAL BUILDING AND LOAN ASSOCIATION.

(Incorporated December 24, 1892.)

W. D. FREDERICK, Secretary. MEL. CAMPBELL, President.

Fiscal year ended December 31, 1917.

No. of series, 21. No. of members and investors, 1,700. No. of shares, 21,334.

Assets.		Liabilities.	
Loans, on mortgages, $1,193,944.02; on shares, $4,510	$1,198,454 02	Installment shares, dues	$232,746 00
Arrearages, on shares	5,219 50	Installment shares, profits	46,544 18
Cash, in office, $5,874.39; in bank, $42,871.45	48,745 84	Paid-up and prepaid shares, capital	939,400 00
Real estate owned, office bldg.	24,500 00	Paid-up and prepaid shares, dividends	25,678 55
Furniture and fixtures	1,100 00	Advance payments	503 00
Other assets, Liberty Bonds	3,000 00	Reserve and undivided profits	14,128 73
		Loans due and incomplete	15,270 89
		Sundry ledger accounts	6,748 01
Total assets	$1,281,019 36	Total liabilities	$1,281,019 36

Receipts for Fiscal Year.		Disbursements for Fiscal Year.	
Balance from last report	$49,080 15	Loans on mortgages and shares	$373,138 68
Installment shares, due	73,847 50	Dues repaid, installment shares	60,636 50
Paid-up and prepaid shares, dues	425,400 00	Profits repaid, installment shares	16,365 70
Interest	78,834 23	Paid-up and prepaid shares, capital	268,000 00
Premiums	194 70	Paid-up and prepaid shares, dividends	41,922 00
Fines	469 08	Advances, personal accounts	9,938 75
Fees	297 83	Salaries	4,948 50
Loans repaid	193,949 75	Taxes	2,276 20
Advances repaid, personal accounts	8,818 55	Other expenses	3,630 38
All other receipts, rents, etc.	2,841 35	All other disbursements, Liberty Bonds and real estate expense	4,130 59
		Balance, cash in office and bank	48,745 84
Total receipts	$833,733 14	Total disbursements	$833,733 14

Installment Shares, With Age, Value, and Withdrawal Value.

Serial No.	Age in months	Total dues per share	Book value per share	Withdrawal value
31	120	$60 00	$86 43	$86 43
33	108	54 00	74 91	72 91
35	96	48 00	64 19	62 19
37	84	42 00	54 11	51 87
39	72	36 00	44 69	41 11
41	60	30 00	35 90	34 84
43	48	24 00	27 69	27 04
45	36	18 00	20 03	19 67
47	24	12 00	12 88	12 73
49	12	6 00	6 22	6 18

No. 37. PORTERVILLE.

PORTERVILLE MUTUAL BUILDING AND LOAN ASSOCIATION.

(Incorporated September 29, 1905.)

C. O. PREMO, Secretary. H. C. CARR, President.

Fiscal year ended October 31, 1917.

No. of series, none. No. of members and investors, 137. No. of shares, 2,731.

Assets.	
Loans, on mortgages, $74,000; on shares, $500	$74,500 00
Arrearages, on interest	1,042 60
Cash, in office, $58.81; in bank, $2,147.76	2,206 57
Real estate owned	703 70
Advances, ledger accounts	184 18
Other assets, Liberty Bond	100 00
Total assets	$78,737 05

Liabilities.	
Installment shares, dues	$51,306 11
Installment shares, profits	21,962 41
Paid-up and prepaid shares, capital	2,200 00
Reserve and undivided profits	2,568 53
Loans due and incomplete	700 00
Total liabilities	$78,737 05

Receipts for Fiscal Year.	
Balance from last report	$7,848 69
Installment shares, dues	13,148 09
Paid-up and prepaid shares, dues	2,200 00
Interest	6,963 48
Fees	65 50
Loans repaid	25,390 00
Overdrafts and bills payable	13,500 00
Advances repaid, personal accounts	270 26
All other receipts, real estate, etc.	3,610 72
Total receipts	$72,996 74

Disbursements for Fiscal Year.	
Overdrafts and bills payable	$15,000 00
Loans on mortgages and shares	16,875 00
Interest paid	544 43
Dues repaid, installment shares	20,263 22
Profits repaid, installment shares	12,470 35
Advances, personal accounts	415 06
Salaries	360 00
Taxes	495 81
Other expenses	162 60
All other disbursements, real estate, etc.	4,203 70
Balance, cash in office and bank	2,206 57
Total disbursements	$72,996 74

Installment Shares, With Age, Value, and Withdrawal Value.

Dayton plan.
Dues 50 cents per share per month.
Dividend, last fiscal year, 7.92 per cent.
Book value, dues plus dividend.
Withdrawal value, full book value.

No. 38. REDLANDS.

HOME INVESTMENT ASSOCIATION.

(Incorporated March 22, 1890.)

J. WARREN SMITH, Secretary. W. T. BILL, President.

Fiscal year ended December 31, 1917.

No. of series, none. No. of members and investors, 1,022. No. of shares, 7,055.

Assets.	
Loans, on mortgages, $18,600; on definite contract, $653,282.37; on shares, $2,002.50; on contract sales, $25,384.28	$699,269 15
Cash, in office, $1,044.16; in bank, $7,591.45	8,635 61
Real estate owned	22,920 35
Furniture and fixtures	1,414 74
Advances, ledger accounts	8,254 78
Total assets	$740,494 63

Liabilities.	
Guarantee stock, capital	$100,000 00
Guarantee stock, surplus and dividends unpaid	26,000 00
Installment shares, dues	48,538 50
Installment shares, profits	11,603 21
Paid-up and prepaid shares, capital	164,546 00
Paid-up and prepaid shares, dividends	5,627 07
Investment certificates, principal	295,661 84
Investment certificates, dividends	7,871 00
Overdrafts and bills payable	50,000 00
Reserve and undivided profits	20,918 70
Loans due and incomplete	9,718 74
Sundry ledger accounts	9 57
Total liabilities	$740,494 63

Receipts for Fiscal Year.	
Balance from last report	$26,896 78
Installment shares, dues	22,439 50
Paid-up and prepaid shares, dues	7,300 00
Investment certificates	281,733 01
Interest	63,604 78
Fines	1,935 12
Fees	3,323 00
Loans repaid	187,601 81
Overdrafts and bills payable	102,000 00
Advances repaid, personal accounts	10,658 31
All other receipts, real estate, etc.	8,952 26
Total receipts	$716,444 57

Disbursements for Fiscal Year.	
Overdrafts and bills payable	$52,000 00
Loans on mortgages and shares	319,333 90
Interest paid	1,458 55
Dividends on guarantee stock	6,000 00
Dues repaid, installment shares	12,243 50
Profits repaid, installment shares	2,510 87
Paid-up and prepaid shares, capital	6,150 00
Paid-up and prepaid shares, dividends	11,246 18
Investment certificates, principal	240,686 70
Investment certificates, dividends	15,943 74
Advances, personal accounts	10,704 81
Salaries	3,806 00
Taxes	670 97
Other expenses	9,842 80
All other disbursements, real estate, etc.	15,210 94
Balance, cash in office and bank	8,635 61
Total disbursements	$716,444 57

Installment Shares, With Age, Value, and Withdrawal Value.

Dayton plan.
Dues, $1.00 per share per month.
Dividend, last fiscal year, 8 per cent.
Book value, dues plus dividend.
Withdrawal value, full book value.

No. 39. REDWOOD CITY.

SAN MATEO COUNTY BUILDING AND LOAN ASSOCIATION.

(Incorporated May 8, 1890.)

W. H. Schaberg, Secretary. P. P. Chamberlain, President.

Fiscal year ended May 31, 1918.

No. of series, 43. No. of members and investors, 493. No. of shares, 3,417

Assets.		
Loans, on mortgages, $18,750; on definite contract, $236,678.52; on shares, $14,005; on contract sales, $3,341.89		$272,775 41
Arrearages—		
On shares	$414 60	
On interest	3,725 52	
		4,140 12
Cash, in office, $476.73; in bank, $21,446.56		21,923 29
Real estate owned		52,601 36
Furniture and fixtures		735 00
Advances, ledger accounts		1,518 16
Other assets, Liberty Bonds		8,000 00
Total assets		$361,693 34

Liabilities.	
Installment shares, dues	$224,862 40
Installment shares, profits	69,465 56
Investment certificates, principal	50,900 00
Advance payments	371 48
Reserve and undivided profits	14,311 57
Loans due and incomplete	1,782 33
Total liabilities	$361,693 34

Receipts for Fiscal Year.	
Balance from last report	$54,651 34
Installment shares, dues	40,308 90
Investment certificates	700 00
Interest	24,453 47
Fines	48 45
Fees	83 55
Loans repaid	79,945 13
Advances repaid, personal accounts	1,594 96
All other receipts, real estate, etc.	3,909 05
Total receipts	$205,694 85

Disbursements for Fiscal Year.	
Loans on mortgages and shares	$79,375 55
Dues repaid, installment shares	48,888 50
Profits repaid, installment shares	23,769 36
Investment certificates, principal	1,700 00
Investment certificates, dividends	2,573 38
Advances, personal accounts	1,441 30
Salaries	3,133 00
Taxes	1,035 87
Other expenses	1,059 35
All other disbursements, real estate, bonds, etc.	20,795 25
Balance, cash in office and bank	21,923 29
Total disbursements	$205,694 85

Installment Shares, With Age, Value, and Withdrawal Value.

Serial No.	Age in months	Total dues per share	Book value per share	Withdrawal value
63	120	$120 00	$173 34	$165 10
67	108	108 00	149 32	143 07
71	96	96 00	127 12	122 50
75	84	84 00	106 63	103 40
79	72	72 00	87 61	84 37
83	60	60 00	69 96	68 15
87	48	48 00	53 83	52 49
91	36	36 00	38 94	38 28
95	24	24 00	25 09	24 88
99	12	12 00	12 18	12 15

No. 40. RIVERSIDE.

RIVERSIDE COUNTY MUTUAL BUILDING AND LOAN ASSOCIATION.

(Incorporated April 5, 1901.)

E. L. Covey, Secretary. W. B. Clancy, President.

Fiscal year ended April 30, 1918.

No. of series, none. No. of members and investors, 157. No. of shares, 2,203.

Assets.	
Loans, on mortgages	$103,450 00
Cash in bank	24,908 00
Real estate owned	8,892 21
Total assets	$137,250 21

Liabilities.	
Installment shares, dues	$27,708 86
Installment shares, profits	7,806 76
Paid-up and prepaid shares, capital	93,400 00
Paid-up and prepaid shares, dividends	2,802 00
Reserve and undivided profits	5,381 49
Loans due and incomplete	151 10
Total liabilities	$137,250 21

Receipts for Fiscal Year.	
Balance from last report	$18,972 06
Installment shares, dues	17,345 32
Paid-up and prepaid shares, dues	700 00
Interest	9,888 44
Loans repaid	20,600 00
Total receipts	$67,505 82

Disbursements for Fiscal Year.	
Loans on mortgages and shares	$7,098 90
Dues repaid, installment shares	18,664 93
Profits repaid, installment shares	3,792 66
Paid-up and prepaid shares, capital	1,900 00
Paid-up and prepaid shares, dividends	6,601 00
Salaries	1,312 54
Taxes	155 57
Other expenses	91 60
All other disbursements, real estate, etc.	2,980 62
Balance, cash in office and bank	24,908 00
Total disbursements	67,505 82

Installment Shares, With Age, Value, and Withdrawal Value.

Dayton plan.
Dues 60 cents per share per month.
Dividend, last fiscal year, 6½ per cent.
Book value, dues plus dividend.
Withdrawal value, full book value.

No. 41. SACRAMENTO.

SACRAMENTO BUILDING AND LOAN ASSOCIATION.

(Incorporated August 26, 1874.)

FRANK HICKMAN, Secretary. JOS. H. ARNOLD, President.

Fiscal year ended February 28, 1918.

No. of series, none. No. of members and investors, 396. No. of shares, 5,709.

Assets.	
Loans, on mortgages, $435,825.36; on shares, $1,025	$436,850 36
Arrearages, on interest	1,606 35
Cash in bank	6,348 03
Furniture and fixtures	315 50
Advances, ledger accounts	323 82
Total assets	$445,444 06

Liabilities.	
Installment shares, dues	$148,929 00
Installment shares, profits	38,369 81
Paid-up and prepaid shares, capital	213,020 00
Paid-up and prepaid shares, dividends	6,824 82
Advance payments	233 95
Reserve and undivided profits	38,066 48
Total liabilities	$445,444 06

Receipts for Fiscal Year.	
Balance from last report	$18,521 30
Installment shares, dues	46,583 00
Paid-up and prepaid shares, dues	42,000 00
Interest	27,002 01
Loans repaid	59,731 00
Advances repaid, personal accounts	91 88
All other receipts, real estate, etc.	1,075 06
Total receipts	$195,004 25

Disbursements for Fiscal Year.	
Loans on mortgages and shares	$108,715 36
Interest paid	10 48
Dues repaid, installment shares	37,534 00
Profits repaid, installment shares	5,600 28
Paid-up and prepaid shares, capital	21,650 00
Paid-up and prepaid shares, dividends	11,465 31
Advances, personal accounts	64 98
Salaries	2,382 50
Taxes	16 75
Other expenses	1,191 86
All other disbursements	24 70
Balance, cash in office and bank	6,348 03
Total disbursements	$195,004 25

Installment Shares, With Age, Value, and Withdrawal Value.

Dayton plan.
Dues, $1.00 per share per month.
Dividend, last fiscal year, 6 per cent.
Book value, dues plus dividend.
Withdrawal value, full book value.

No. 42. SAN BERNARDINO.

SANTA FE BUILDING AND LOAN ASSOCIATION.

(Incorporated January 8, 1890.)

JOHN FLAGG, Secretary. J. F. PARKER, President.

Fiscal year ended December 31, 1917.

No. of series, 11. No. of members and investors, 1,133. No. of shares, 11,970.

Assets.

Loans, on mortgages, $761,525.95; on defin'te contract, $190,417.18; on shares, $26,441.60; on contract sales, $22,677.07		$1,001,061 80
Arrearages—		
On shares	$3,205 00	
On interest	3,829 75	
On fines	90 10	
		7,124 85
Cash, in office, $4,084; in bank, $9,049.29		13,133 29
Real estate owned		24,427 84
Furniture and fixtures		300 00
Other assets, Liberty Bonds		5,000 00
Total assets		$1,051,047 78

Liabilities.

Installment shares, dues	$674,591 90
Installment shares, profits	222,116 43
Investment certificates, principal	129,035 00
Investment certificates, dividends	60 00
Reserve and undivided profits	23,542 40
Loans due and incomplete	1,702 05
Total liabilit'es	$1,051,047 78

Receipts for Fiscal Year.

Balance from last report	$9,281 01
Installment shares, dues	154,058 70
Investment certificates	25,350 00
Interest	87,242 02
Fines and fees	454 72
Loans repaid	309,768 92
All other receipts, real estate, etc.	3,948 90
Total receipts	$590,104 27

Disbursements for Fiscal Year.

Loans on mortgages and shares	$242,418 41
Dues repaid, installment shares	135,661 80
Profits repaid, installment shares	48,551 38
Investment certificates, principal	114,210 00
Investment certificates, dividends	11,241 62
Salaries	3,780 00
Taxes	1,007 60
Other expenses	1,379 53
All other disbursements, real estate, bonds, etc.	18,720 64
Balance, cash in office and bank	13,133 29
Total disbursements	$590,104 27

Installment Shares, With Age, Value, and Withdrawal Value.

Serial No.	Age in months	Total dues per share	Book value per share	Withdrawal value
28	120	$120 00	$190 59	$190 59
29	108	108 00	163 17	160 41
30	96	96 00	138 06	135 95
31	84	84 00	115 07	111 96
32	72	72 00	94 01	89 61
33	60	60 00	74 73	70 31
34	48	48 00	57 07	53 44
35	36	36 00	40 90	38 45
36	24	24 00	26 09	25 04
37	12	12 00	12 52	12 26

No. 43. SAN DIEGO.

SAN DIEGO BUILDING AND LOAN ASSOCIATION.

(Incorporated July 14, 1885.)

J. R. Beardsley, Secretary. W. R. Rogers, President.

Fiscal year ended June 30, 1918.

No. of series, 22. No. of members and investors, 432. No. of shares, 3,010.

Assets.		
Loans, on mortgages, $290,950; on shares, $6,305		$297,255 00
Arrearages—		
On shares	$1,034 00	
On interest	895 55	
		1,929 55
Cash, in office, $2,080.18; in bank, $6,042.57		8,122 75
Real estate owned		1,493 16
Furniture and fixtures		300 00
Total assets		$309,100 46

Liabilities.	
Installment shares, dues	$153,690 00
Installment shares, profits	36,679 56
Investment certificates, principal	96,600 00
Investment certificates, dividends	2,856 85
Advance payments	611 15
Overdrafts and bills payable	7,000 00
Reserve and undivided profits	10,656 90
Loans due and incomplete	306 00
All other liabilities, tax reserve	700 00
Total liabilities	$309,100 46

Receipts for Fiscal Year.	
Balance from last report	$8,457 68
Installment shares, dues	36,859 00
Investment certificates	6,800 00
Interest	20,987 35
Fines	119 85
Fees	52 10
Loans repaid	41,675 00
Overdrafts and bills payable	7,000 00
All other receipts, rents	180 00
Total receipts	$122,130 98

Disbursements for Fiscal Year.	
Overdrafts and bills payable	$6,000 00
Loans on mortgages and shares	52,114 00
Interest paid	298 20
Dues repaid, installment shares	31,703 00
Profits repaid, installment shares	11,385 39
Investment certificates, principal	4,000 00
Investment certificates, dividends	5,556 95
Salaries	1,800 00
Taxes	695 76
Other expenses	454 93
Balance, cash in office and bank	8,122 75
Total disbursements	$122,130 98

Installment Shares, With Age, Value, and Withdrawal Value.

Serial No.	Age in months	Total dues per share	Book value per share	Withdrawal value
29	120	$120 00	$169 54	$149 75
31	108	108 00	147 09	132 37
33	96	96 00	126 04	115 00
35	84	84 00	106 36	98 52
37	72	72 00	89 97	82 65
39	60	60 00	70 78	67 37
41	48	48 00	54 73	52 70
43	36	36 00	39 68	38 62
45	24	24 00	25 58	25 15
47	12	12 00	12 37	12 27

No. 44. SAN DIEGO.

SILVER GATE BUILDING AND LOAN ASSOCIATION.

(Incorporated May 22, 1890.)

HERBERT A. CROGHAN, Secretary. M. A. GRAHAM, President.

Fiscal year ended May 31, 1918.

No. of series, 22. No. of members and investors, 243. No. of shares, 2,774.

Assets.	
Loans, on mortgages, $164,559.93; on shares, $19,965	$184,524 93
Cash, in office, $6,019.21; in bank, $18,264.75	24,283 96
Real estate owned	3,594 59
Other assets, Liberty Bonds	1,300 00
Total assets	$213,703 48

Liabilities.	
Installment shares, dues	$153,654 00
Installment shares, profits	40,091 18
Investment certificates, principal	18,350 00
Reserve and undivided profits	1,608 30
Total liabilities	$213,703 48

Receipts for Fiscal Year.	
Balance from last report	$26,604 19
Installment shares, dues	35,242 00
Interest	15,062 30
Fees	32 90
Loans repaid	44,965 80
All other receipts	18 00
Total receipts	$121,925 19

Disbursements for Fiscal Year.	
Loans on mortgages and shares	$19,454 93
Dues repaid, installment shares	51,712 00
Profits repaid, installment shares	17,625 11
Investment certificates, principal	3,200 00
Investment certificates, dividends	1,313 60
Salaries	850 00
Taxes	983 90
Other expenses	66 00
All other disbursements, bonds, real estate, etc.	2,435 69
Balance, cash in office and bank	24,283 96
Total disbursements	$121,925 19

Installment Shares, With Age, Value, and Withdrawal Value.

Serial No.	Age in months	Total dues per share	Book value per share	Withdrawal value
27	120	$120 00	$166 83	$150 00
29	108	108 00	144 72	132 30
31	96	96 00	124 51	115 20
33	84	84 00	105 27	98 70
35	72	72 00	87 22	82 80
37	60	60 00	70 36	67 50
39	48	48 00	54 52	52 80
41	36	36 00	39 62	38 70
43	24	24 00	25 62	24 70
45	12	12 00	12 42	12 30

No. 45. SAN FRANCISCO.

ARGONAUT MUTUAL BUILDING AND LOAN ASSOCIATION.

(Incorporated January 31, 1891.)

BENJ. M. STICH, Secretary. B. M. GUNZBURGER, President.

Fiscal year ended February 11, 1918.

No. of series, 9. No. of members and investors, 52. No. of shares, 215.

Assets.

Loans, on mortgages, $19,100; on shares, $6,600; on contract sales, $7,055.53		$32,755 53
Arrearages—		
On shares	$664 00	
On interest	1,212 19	
On premium	489 40	
		2,365 59
Cash, in office, $417.26; in bank, $5,472.01		5,889 27
Real estate owned		5,160 05
Advances, ledger accounts		1,008 78
Total assets		$47,179 22

Liabilities.

Installment shares, dues	$14,172 00
Installment shares, profits	3,969 78
Overdrafts and bills payable	10,200 00
Reserve and undivided profits	13,320 87
Sundry ledger accounts	2,221 75
All other liabilities, suspense	3,294 82
Total liabilities	$47,179 22

Receipts for Fiscal Year.

Balance from last report	$2,644 47
Installment shares, dues	3,545 00
Interest	2,932 46
Premiums	869 40
Fees	1 10
Loans repaid	7,398 87
Advances repaid, personal accounts	3,537 99
All other receipts, real estate, etc.	5,679 14
Total receipts	$26,608 43

Disbursements for Fiscal Year.

Overdrafts and bills payable	$1,500 00
Loans on mortgages and shares	6,354 25
Interest paid	672 00
Dues repaid, installment shares	3,202 00
Profits repaid, installment shares	871 31
Advances, personal accounts	1,093 88
Salaries	1,230 00
Taxes	192 48
Other expenses	315 49
All other disbursements, real estate	5,287 75
Balance, cash in office and bank	5,889 27
Total disbursements	$26,608 43

Installment Shares, With Age, Value, and Withdrawal Value.

Serial No.	Age in months	Total dues per share	Book value per share	Withdrawal value
19	108	$108 00	$154 63	$140 64
20	96	96 00	131 48	119 06
21	84	84 00	110 09	99 65
22	72	72 00	90 46	82 15
23	60	60 00	72 29	66 14
24	48	48 00	55 58	51 79
25	36	36 00	40 09	38 04
26	24	24 00	25 77	24 88
27	12	12 00	12 45	12 22

No. 46. SAN FRANCISCO.

BAY CITY BUILDING AND LOAN ASSOCIATION.

(Incorporated May 9, 1889.)

B. M. GUNZBURGER, Secretary. H. L. GUNZBURGER, President.

Fiscal year ended May 28, 1918.

No. of series, 10. No. of members and investors, 76. No. of shares, 325.

Assets.		
Loans, on mortgages, $38,000; on shares, $1,500; on contract sales, $9,587.34		$49,087 34
Arrearages—		
On shares	$513 00	
On interest	916 47	
On premium	345 15	
		1,774 62
Cash, in office, $483.19; in bank, $1,900.01		2,383 20
Real estate owned		2,040 12
Advances, ledger accounts		3,450 03
Total assets		$58,735 31

Liabilities.	
Installment shares, dues	$19,236 00
Installment shares, profits	5,014 73
Overdrafts and bills payable	10,070 05
Reserve and undivided profits	24,233 25
Sundry ledger accounts	181 28
Total liabilities	$58,735 31

Receipts for Fiscal Year.	
Balance from last report	$4,270 32
Installment shares, dues	4,261 00
Interest	3,298 69
Premiums	1,265 25
Fees	2 70
Loans repaid	5,387 39
Advances repaid, personal accounts	921 08
All other receipts	309 70
Total receipts	$19,716 13

Disbursements for Fiscal Year.	
Overdrafts and bills payable	$9,017 15
Loans on mortgages and shares	550 88
Interest paid	675 09
Dues repaid, installment shares	2,143 00
Profits repaid, installment shares	764 80
Advances, personal accounts	1,339 98
Salaries	1,230 00
Taxes	420 16
Other expenses	215 85
All other disbursements, real estate, etc.	976 02
Balance, cash in office and bank	2,383 20
Total disbursements	$19,716 13

Installment Shares, With Age, Value, and Withdrawal Value.

Serial No.	Age in months	Total dues per share	Book value per share	Withdrawal value
20	120	$120 00	$181 47	$166 10
21	108	108 00	155 74	141 41
22	96	96 00	132 02	119 41
23	84	84 00	110 25	99 77
24	72	72 50	90 28	82 05
25	60	60 00	71 98	65 99
26	48	48 00	55 18	51 59
27	36	36 00	39 79	37 89
28	24	24 00	25 58	24 79
29	12	12 00	12 39	12 19

No. 47. SAN FRANCISCO.

BAY VIEW BUILDING AND LOAN ASSOCIATION.

(Incorporated November 18, 1911.)

D. A. Steinbaugh, Secretary. Jas. Allan, President.

Fiscal year ended December 31, 1917.

No. of series, none. No. of members and investors, 88. No. of shares, 986.

Assets.		Liabilities.	
Loans, on definite contract	$69,317 87	Installment shares, dues	$50,312 84
Arrearages, on interest	205 84	Installment shares, profits	7,370 90
Cash, in office, $67.26; in bank, $95.21	162 47	Overdrafts and bills payable	11,550 23
Real estate owned	305 45	Reserve and undivided profits	595 72
Advances, ledger accounts	84 78	Sundry ledger accounts	246 72
Total assets	$70,076 41	Total liabilities	$70,076 41

Receipts for Fiscal Year.		Disbursements for Fiscal Year.	
Balance from last report	$1,590 54	Overdrafts and bills payable	$25,945 13
Installment shares, dues	24,940 50	Loans on mortgages and shares	41,332 80
Interest	5,225 99	Interest paid	229 39
Fines	6 32	Dues repaid, installment shares	11,674 50
Fees	114 00	Profits repaid, installment shares	356 86
Loans repaid	18,674 85	Advances, personal accounts	800 37
Overdrafts and bills payable	30,795 36	Salaries	958 58
Advances repaid, personal accounts	738 66	Taxes	94 52
		Other expenses	205 62
		All other disbursements	325 98
		Balance, cash in office and bank	162 47
Total receipts	$82,086 22	Total disbursements	$82,086 22

Installment Shares, With Age, Value, and Withdrawal Value.

Dayton plan.
Dues, $1.00 per share per month.
Dividend, last fiscal year, 7 per cent.
Book value, dues plus dividend.
Withdrawal value, full book value.

No. 48. SAN FRANCISCO.

CALIFORNIA HOME BUILDING-LOAN COMPANY.

(Incorporated July 8, 1889.)

R. L. HANDY, Secretary. P. B. ROBERTS, President.

Fiscal year ended June 30, 1918.

No. of series, none. No. of members and investors, 609. No. of shares, 1,469.

Assets.	
Loans, on definite contract, $514,136.62; on shares, $15,130; on contract sales, $49,769.24	$579,035 86
Arrearages, on interest	1,081 47
Cash, in office, $1,827.77; in bank, $6,439.42	8,267 19
Real estate owned	48,357 24
Furniture and fixtures	1,862 05
Advances, ledger accounts	11,335 76
Other assets, bonds, etc.	2,738 93
Total assets	$652,678 50

Liabilities.	
Guarantee stock, capital	$37,500 00
Guarantee stock, surplus	7,858 80
Installment shares, dues	33,711 60
Installment shares, profits	11,629 62
Paid-up and prepaid shares, capital	32,550 00
Paid-up and prepaid shares, dividends	5,771 32
Investment certificates, principal	398,254 09
Investment certificates, dividends	17,134 17
Overdrafts and bills payable	97,754 68
Reserve and undivided profits	1,911 06
Loans due and incomplete	6,801 18
All other liabilities, dividends unpaid, etc.	1,801 98
Total liabilities	$652,678 50

Receipts for Fiscal Year.	
Balance from last report	$16,883 04
Installment shares, dues	4,825 80
Investment certificates	285,769 90
Interest	52,704 59
Premiums	998 45
Fines	338 48
Loans repaid	203,430 11
Overdrafts and bills payable	63,601 42
Advances repaid, personal accounts	18,884 42
All other receipts, real estate, etc.	18,995 17
Total receipts	$666,431 38

Disbursements for Fiscal Year.	
Overdrafts and bills payable	$59,306 00
Loans on mortgages and shares	173,911 85
Interest paid	7,059 35
Dividends on guarantee stock	3,000 00
Paid-up and prepaid shares, dividends	1,953 00
Investment certificates, principal	323,393 85
Investment certificates, dividends	20,227 25
Advances, personal accounts	17,770 04
Salaries	9,780 00
Taxes	3,475 07
Other expenses	4,141 21
All other disbursements, real estate, etc.	34,146 57
Balance, cash in office and bank	8,267 19
Total disbursements	$666,431 38

Installment Shares, With Age, Value, and Withdrawal Value.

Dayton plan.
Dues, 60 cents per share per month.
Dividend, last fiscal year, 7 per cent.
Book value, dues plus dividend.
Withdrawal value, dues plus profits as per by-laws.

No. 49. SAN FRANCISCO.

CALIFORNIA MUTUAL SAVINGS FUND LOAN AND BUILDING ASSOCIATION.

(Incorporated March 26, 1887.)

WM. E. BOUTON, Secretary. RICHARD I. WHELAN, President.

Fiscal year ended March 31, 1918.

No. of series, 26. No. of members and investors, 89. No. of shares, 1,198.

Assets.		
Loans, on mortgages, $21,850; on definite contract, $31,165.41; on shares, $5,157.50; on contract sales, $4,343.32		$62,516 23
Arrearages—		
On shares	$40 00	
On interest	108 92	
		148 92
Cash, in office, $40.20; in bank, $4,934.55		4,974 75
Real estate owned		3,158 18
Advances, ledger accounts		71 06
Other assets, U. S. bonds		1,000 00
Total assets		$71,869 14

Liabilities.	
Installment shares, dues	$45,680 00
Installment shares, profits	9,212 86
Advance payments	140 00
Overdrafts and bills payable	9,100 00
Reserve and undivided profits	7,649 78
All other liabilities, interest on bills payable	86 50
Total liabilities	$71,869 14

Receipts for Fiscal Year.	
Balance from last report	$4,594 19
Installment shares, dues	11,366 00
Interest	4,983 53
Fines	10 23
Fees	25 10
Loans repaid	19,890 38
Overdrafts and bills payable	6,400 00
Advances repaid, personal accounts	550 25
All other receipts, rents, etc.	291 51
Total receipts	$48,111 19

Disbursements for Fiscal Year.	
Overdrafts and bills payable	$8,400 00
Loans on mortgages and shares	21,947 50
Interest paid	587 47
Dues repaid, installment shares	5,535 00
Profits repaid, installment shares	953 92
Advances, personal accounts	146 70
Salaries	1,117 50
Taxes	86 81
Other expenses	180 90
All other disbursements, real estate, bonds, etc.	4,180 64
Balance, cash in office and bank	4,974 75
Total disbursements	$48,111 19

Installment Shares, With Age, Value, and Withdrawal Value.

Serial No.	Age in months	Total dues per share	Book value per share	Withdrawal value
42	120	$120 00	$172 25	
44	102	102 00	138 42	Dues plus profits as per by-laws.
46	96	96 00	127 82	
49	84	84 00	107 66	
51	72	72 00	88 82	
55	60	60 00	71 42	
59	48	48 00	55 34	
63	36	36 00	40 16	
67	24	24 00	25 85	
71	12	12 00	12 45	

No. 50. SAN FRANCISCO.

CITIZENS BUILDING AND LOAN ASSOCIATION.

(Incorporated January 14, 1885.)

FREMONT WOOD, Secretary. THOS. M. GARDINER, President.

Fiscal year ended February 14, 1918.

No. of series, 45. No. of members and investors, 709. No. of shares, 6,999.

Assets.

Loans, on mortgages, $136,450; on definite contract, $318,384.90; on shares, $8,700; on contract sales, $13,835.81		$477,370 71
Arrearages—		
On shares	$547 30	
On interest	4,363 43	
On fines and fees	2,416 85	
		7,327 58
Cash, in office, $1,000; in bank, $3,149.45		4,149 45
Real estate owned		24,462 77
Furniture and fixtures		666 00
Advances, ledger accounts		1,765 96
Other assets, U. S. bonds		15,000 00
Total assets		$530,742 47

Liabilities.

Installment shares, dues	$286,740 10
Installment shares, profits	78,806 26
Advance payments	494 90
Overdrafts and bills payable	134,105 57
Reserve and undivided profits	18,999 70
Loans due and incomplete	10,353 00
Sundry ledger accounts	1,014 04
All other liabilities, tax reserve	228 90
Total liabilities	$530,742 47

Receipts for Fiscal Year.

Balance from last report	$1,000 00
Installment shares, dues	61,970 80
Interest	37,877 46
Fines	1,015 51
Fees	284 85
Loans repaid	201,557 14
Overdrafts and bills payable	149,018 81
Advances repaid, personal accounts	2,125 76
All other receipts, real estate, etc.	8,151 47
Total receipts	$463,001 80

Disbursements for Fiscal Year.

Overdrafts and bills payable	$156,276 49
Loans on mortgages and shares	172,981 51
Interest paid	7,323 67
Dues repaid, installment shares	61,800 30
Profits repaid, installment shares	23,848 82
Advances, personal accounts	2,222 65
Salaries	3,974 75
Taxes	306 94
Other expenses	1,824 05
All other disbursements, real estate, bonds, etc.	28,293 17
Balance, cash in office and bank	4,149 45
Total disbursements	$463,001 80

Installment Shares, With Age, Value, and Withdrawal Value.

Serial No.	Age in months	Total dues per share	Book value per share	Withdrawal value
92	120	$120 00	$169 49	$164 54
96	108	108 00	147 24	143 32
100	96	96 00	127 21	122 53
104	84	84 00	107 81	104 24
108	72	72 00	89 42	85 93
112	60	60 00	71 92	69 52
116	48	48 00	55 51	54 11
120	36	36 00	40 17	39 13
124	24	24 00	25 86	25 39
128	12	12 00	12 49	12 37

No. 51. SAN FRANCISCO.

EMPIRE BUILDING AND LOAN ASSOCIATION.

(Incorporated August 24, 1889.)

W. E. BOUTON, Secretary. LOUIS MULLER, Vice President.

Fiscal year ended August 31, 1917.

No. of series, 22. No. of members and investors, 59. No. of shares, 714.

Assets.		Liabilities.	
*Loans, on mortgages, $46,700; on definite contract, $7,905.65; on shares, $485	$55,090 65	Installment shares, dues	$28,955 00
Arrearages, on interest	328 95	Installment shares, profits	5,414 26
Cash in bank	753 25	Advance payments	25 00
Advances, ledger accounts	267 45	Overdrafts and bills payable	16,000 00
		Reserve and undivided profits	6,006 04
		All other liabilities, interest on bills payable	40 00
Total assets	$56,440 30	Total liabilities	$56,440 30

Receipts for Fiscal Year.		Disbursements for Fiscal Year.	
Balance from last report	$282 00	Overdrafts and bills payable	$7,550 00
Installment shares, dues	7,828 60	Loans on mortgages and shares	7,160 00
Interest	4,509 91	Interest paid	632 85
Fines	166 96	Dues repaid, installment shares	14,880 00
Fees	15 00	Profits repaid, installment shares	4,220 62
Loans repaid	11,797 14	Advances, personal accounts	399 86
Overdrafts and bills payable	11,000 00	Salaries	1,037 50
Advances repaid, personal accounts	206 17	Taxes	261 88
All other receipts, real estate, etc.	1,342 85	Other expenses	252 67
		Balance, cash in office and bank	753 25
Total receipts	$37,148 63	Total disbursements	$37,148 63

Installment Shares, With Age, Value, and Withdrawal Value.

Serial No.	Age in months	Total dues per share	Book value per share	Withdrawal value
19	120	$120 00	$163 56	
20	108	108 00	143 31	Dues plus profits as per by-laws.
21	96	96 00	123 93	
25	81	81 00	100 92	
33	57	57 00	66 92	
37	45	45 00	51 21	
40	36	36 00	39 99	
44	24	24 00	25 80	
48	12	12 00	12 43	

No. 52. SAN FRANCISCO.

EUREKA BUILDING AND LOAN ASSOCIATION.

(Incorporated November 3, 1890.)

W. E. BOUTON, Secretary. WILLIAM DONALD, President.

Fiscal year ended October 31, 1917.

No. of series, 13. No. of members and investors, 59. No. of shares, 719.

Assets.		
Loans, on definite contract, $37,243.89; on shares, $1,300		$38,543 89
Arrearages—		
On shares	$268 60	
On interest	705 16	
		973 76
Cash in bank		452 35
Real estate owned		5,658 92
Advances, ledger accounts		400 33
Total assets		$46,029 25

Liabilities.	
Installment shares, dues	$22,767 60
Installment shares, profits	3,629 05
Paid-up and prepaid shares, capital	8,500 00
Paid-up and prepaid shares, dividends	255 00
Advance payments	10 95
Overdrafts and bills payable	6,000 00
Reserve and undivided profits	2,443 38
Loans due and incomplete	1,600 00
All other liabilities, real estate, suspense, etc.	823 27
Total liabilities	$46,029 25

Receipts for Fiscal Year.	
Balance from last report	$909 73
Installment shares, dues	6,142 80
Paid-up and prepaid shares, dues	5,500 00
Interest	3,011 75
Fines	34 89
Fees	6 60
Loans repaid	7,804 18
Overdrafts and bills payable	4,350 00
Advances repaid, personal accounts	70 89
All other receipts, rents, etc.	148 55
Total receipts	$27,979 39

Disbursements for Fiscal Year.	
Overdrafts and bills payable	$4,650 00
Loans on mortgages and shares	6,900 00
Interest paid	425 40
Dues repaid, installment shares	9,555 30
Profits repaid, installment shares	2,400 60
Paid-up and prepaid shares, dividends	299 33
Advances, personal accounts	323 14
Salaries	744 00
Taxes	126 98
Other expenses	196 32
All other disbursements, real estate, etc.	1,905 97
Balance, cash in office and bank	452 35
Total disbursements	$27,979 39

Installment Shares, With Age, Value, and Withdrawal Value.

Serial No.	Age in months	Total dues per share	Book value per share	Withdrawal value
34	108	$108 00	$138 36	Dues plus profits as per by-laws.
36	96	96 00	119 44	
38	84	84 00	101 52	
39	72	72 00	84 52	
40	60	60 00	68 43	
42	48	48 00	53 15	
44	36	36 00	38 73	
46	24	24 00	25 19	
48	12	12 00	12 32	

No. 53. SAN FRANCISCO.

FIDELITY BUILDING AND LOAN ASSOCIATION.

(Incorporated March 19, 1887.)

WM. E. BOUTON, Secretary. WM. A. BARLAGE, President.

Fiscal year ended March 31, 1918.

No. of series, 37. No. of members and investors, 187. No. of shares, 2,523.

Assets.	
Loans on mortgages, $88,850; on definite contract, $75,111.97; on shares, $9,788.48; on contract sales, 11,116.45	$184,866 89
Arrearages—	
On shares $275 00	
On interest 3,014 82	3,289 82
Cash, in office, $541 61; in bank, $2,082.47	2,624 08
Real estate owned	10,475 55
Advances, ledger accounts	634 30
Other assets, U. S. bonds, etc.	2,001 00
Total assets	$203,891 64

Liabilities.	
Installment shares, dues	$92,290 00
Installment shares, profits	24,142 04
Paid-up and prepaid shares, capital	2,000 00
Paid-up and prepaid shares, dividends	10 00
Advance payments	168 29
Overdrafts and bills payable	59,300 00
Reserve and undivided profits	23,104 74
Loans due and incomplete	2,461 82
All other liabilities, tax reserve, etc.	414 75
Total liabilities	$203,891 64

Receipts for Fiscal Year.	
Balance from last report	$3,989 40
Installment shares, dues	21,791 30
Paid-up and prepaid shares, dues	2,000 00
Interest	14,705 65
Fines	371 55
Fees	64 90
Loans repaid	69,818 15
Overdrafts and bills payable	18,800 00
Advances repaid, personal accounts	1,261 51
All other receipts, tax refund, etc.	123 48
Total receipts	$132,925 94

Disbursements for Fiscal Year.	
Overdrafts and bills payable	$18,500 00
Loans on mortgages and shares	75,928 18
Interest paid	3,436 85
Dues repaid, installment shares	11,480 30
Profits repaid, installment shares	3,393 74
Advances, personal accounts	1,293 00
Salaries	2,325 00
Taxes	176 33
Other expenses	292 76
All other disbursements, real estate and bonds	13,475 70
Balance, cash in office and bank	2,624 08
Total disbursements	$132,925 94

Installment Shares, With Age, Value, and Withdrawal Value.

Serial No.	Age in months	Total dues per share	Book value per share	Withdrawal value
34	120	$120 00	$181 70	
36	108	108 00	158 03	Dues plus profits as per by-laws.
39	96	96 00	135 47	
43	84	84 00	114 34	
47	72	72 00	94 33	
51	60	60 00	95 55	
55	48	48 00	57 99	
59	36	36 00	41 61	
63	24	24 00	26 25	
67	12	12 00	12 61	

No. 54. SAN FRANCISCO.

FRANKLIN MUTUAL BUILDING AND LOAN ASSOCIATION.

(Incorporated October 23, 1906.)

B. FEDDE, Secretary. OTTO F. E. BURMEISTER, President.

Fiscal year ended December 31, 1917.

No. of series, none. No. of members and investors, 295. No. of shares, 3,752.

Assets.	
Loans, on mortgages, $48,410; on definite contract, $176,139.27	$224,549 27
Arrearages, on interest	1,485 43
Cash in office, $875.48; in bank, $2,462.90	3,338 38
Real estate owned	8,931 05
Furniture and fixtures	1 00
Advances, ledger accounts	68 30
Total assets	$238,373 43

Liabilities.	
Installment shares, dues	$150,854 70
Installment shares, profits	23,658 68
Paid-up and prepaid shares, capital	27,300 00
Advance payments	54 80
Overdrafts and bills payable	28,000 00
Reserve and undivided profits	8,181 68
All other liabilities, interest on bills payable	323 57
Total liabilities	$238,373 43

Receipts for Fiscal Year.	
Balance from last report	$17,141 73
Installment shares, dues	48,424 69
Interest	17,186 14
Fees	208 54
Loans repaid	76,139 79
Advances repaid, personal accounts	1,352 55
All other receipts, real estate, etc.	892 17
Total receipts	$161,345 61

Disbursements for Fiscal Year.	
Overdrafts and bills payable	$16,000 00
Loans on mortgages and shares	92,085 00
Interest paid	2,565 00
Dues repaid, installment shares	25,762 66
Profits repaid, installment shares	4,244 36
Paid-up and prepaid shares, dividends	2,059 15
Advances, personal accounts	1,300 00
Salaries	2,809 50
Taxes	223 54
Other expenses	1,134 80
All other disbursements, real estate, etc.	9,823 22
Balance, cash in office and bank	3,338 38
Total disbursements	$161,345 61

Installment Shares, With Age, Value, and Withdrawal Value.

Dayton plan.
Dues, $1.00 per share per month.
Dividend, last fiscal year, 5 per cent.
Book value, dues plus dividend.
Withdrawal value, dues plus profits apportioned.

No. 55. SAN FRANCISCO.

GLOBE MUTUAL BUILDING AND LOAN ASSOCIATION.

(Incorporated March 30, 1898.)

R. F. CASSIDY, Secretary. FRANK OTIS, President.

Fiscal year ended March 31, 1918.

No. of series, 16. No. of members and investors, 163. No. of shares, 3,227.

Assets.		
Loans, on definite contract, $120,769.67; on shares, $30		$120,799 67
Arrearages—		
On shares	$162 90	
On interest	775 91	
		938 81
Cash in bank		3,875 84
Real estate owned		1,532 21
Advances, ledger accounts		366 65
Other assets, U. S. bonds		1,000 00
Total assets		$128,513 18

Liabilities.	
Installment shares, dues	$34,633 20
Installment shares, profits	11,110 82
Paid-up and prepaid shares, capital	64,700 00
Paid-up and prepaid shares, dividends	3,563 10
Advance payments	966 00
Reserve and undivided profits	13,512 64
Loans due and incomplete	27 42
Total liabilities	$128,513 18

Receipts for Fiscal Year.	
Balance from last report	$905 10
Installment shares, dues	6,750 60
Investment certificates	5,900 00
Interest	10,678 01
Fines	111 35
Fees	12 50
Loans repaid	32,886 82
Overdrafts and bills payable	3,750 00
Total receipts	$60,994 38

Disbursements for Fiscal Year.	
Overdrafts and bills payable	$6,000 00
Loans on mortgages and shares	28,338 08
Interest paid	88 86
Dues repaid, installment shares	1,290 00
Profits repaid, installment shares	255 00
Paid-up and prepaid shares, capital	500 00
Paid-up and prepaid shares, dividends	5,207 00
Investment certificates, principal	10,400 00
Investment certificates, dividends	342 07
Advances, personal accounts	355 60
Salaries	1,427 50
Taxes	3 80
Other expenses	378 42
All other disbursements, real estate, etc.	2,532 21
Balance, cash in office and bank	3,875 84
Total disbursements	$60,994 38

Installment Shares, With Age, Value, and Withdrawal Value.

Serial No.	Age in months	Total dues per share	Book value per share	Withdrawal value
34	114	$57 00	$85 82	$80 68
37	96	48 00	67 87	63 80
39	84	42 00	56 90	53 49
41	72	36 00	46 74	44 14
43	60	30 00	36 70	34 50
45	48	24 00	28 66	26 95
47	36	18 00	20 63	19 81
49	24	12 00	13 20	12 81
51	12	6 00	6 33	6 27

No. 56. SAN FRANCISCO.

HOME MUTUAL DEPOSIT LOAN COMPANY.

(Incorporated November 30, 1885.)

A. R. Knoll, Secretary. Geo. M. Mitchell, President.

Fiscal year ended December 31, 1917.

No. of series, none. No. of members and investors, 149. No. of shares, 721.

Assets.	
Loans, on definite contract, $248,164.89; on contract sales, $1,463.89	$249,628 78
Arrearages, on interest	2,375 93
Cash, in office, $221.40; in bank, $1,572.64	1,794 04
Real estate owned	3,971 66
Furniture and fixtures	100 00
Advances, ledger accounts	1,191 91
Other assets, Liberty Bonds	2,000 00
Total assets	$261,062 32

Liabilities.	
Guarantee stock, capital	$25,000 00
Guarantee stock, surplus	923 75
Installment shares, dues	23,995 40
Installment shares, profits	7,997 09
Paid-up and prepaid shares, capital	44,025 70
Paid-up and prepaid shares, dividends	1,353 30
Investment certificates, principal	109,566 00
Investment certificates, dividends	4,263 43
Overdrafts and bills payable	9,000 00
Reserve and undivided profits	19,059 90
Loans due and incomplete	11,390 96
Sundry ledger accounts	300 86
All other liabilities, dividends, etc.	4,185 93
Total liabilities	$261,062 32

Receipts for Fiscal Year.	
Balance from last report	$310 59
Installment shares, dues	8,868 65
Investment certificates	50,154 30
Interest	18,854 39
Fines	257 77
Loans repaid	73,739 22
Overdrafts and bills payable	54,500 00
Advances repaid, personal accounts	2,817 25
All other receipts, real estate, etc.	4,261 82
Total receipts	$213,763 99

Disbursements for Fiscal Year.	
Overdrafts and bills payable	$47,500 00
Loans on mortgages and shares	68,386 31
Interest paid	560 25
Dividends on guarantee stock	3,640 00
Dues repaid, installment shares	12,711 45
Profits repaid, installment shares	2,997 15
Paid-up and prepaid shares, capital	2,800 00
Paid-up and prepaid shares, dividends	2,116 60
Investment certificates, principal	54,927 60
Investment certificates, dividends	4,499 25
Advances, personal accounts	4,163 18
Salaries	3,557 50
Taxes	409 68
Other expenses	1,700 98
All other disbursements, Liberty Bonds	2,000 00
Balance, cash in office and bank	1,794 04
Total disbursements	$213,763 99

Installment Shares, With Age, Value, and Withdrawal Value.

Dayton plan.
Dues, $1.00 per share per month.
Dividend, last fiscal year, 6 per cent.
Book value, dues plus dividend.
Withdrawal value, dues plus 95 per cent of profits.

No. 57. SAN FRANCISCO.

MECHANICS BUILDING AND LOAN ASSOCIATION.

(Incorporated January 6, 1891.)

W. E. BOUTON, Secretary. FREDERICK FILLMORE, President.

Fiscal year ended December 31, 1917.

No. of series, 26. No. of members and investors, 59. No. of shares, 954.

Assets.	
Loans, on mortgages, $78,600; on definite contract, $7,196.39; on shares, $750	$86,546 39
Cash in bank	190 94
Advances, ledger accounts	21 00
Total assets	$86,758 33

Liabilities.	
Installment shares, dues	$35,317 00
Installment shares, profits	7,893 62
Paid-up and prepaid shares, capital	5,000 00
Advance payments	31 53
Overdrafts and bills payable	31,250 00
Reserve and undivided profits	7,094 46
All other liabilities, interest and taxes	171 72
Total liabilities	$86,758 33

Receipts for Fiscal Year.	
Balance from last report	$528 58
Installment shares, dues	9,646 05
Paid-up and prepaid shares, dues	3,000 00
Interest	6,420 41
Fines	83 17
Fees	13 70
Loans repaid	6,746 48
Overdrafts and bills payable	8,900 00
Advances repaid, personal accounts	25 76
All other receipts, tax adjustments	117 28
Total receipts	$35,481 43

Disbursements for Fiscal Year.	
Overdrafts and bills payable	$5,150 00
Loans on mortgages and shares	7,950 00
Interest paid	1,697 11
Dues repaid, installment shares	13,990 00
Profits repaid, installment shares	4,527 24
Paid-up and prepaid shares, dividends	296 00
Advances, personal accounts	20 76
Salaries	1,137 00
Taxes	358 47
Other expenses	163 91
Balance, cash in office and bank	190 94
Total disbursements	$35,481 43

Installment Shares, With Age, Value, and Withdrawal Value.

Serial No.	Age in months	Total dues per share	Book value per share	Withdrawal value
29	120	$120 00	$167 19	
31	108	108 00	146 25	
33	96	96 00	126 26	
36	84	84 00	107 20	
40	72	72 00	89 08	
44	60	60 00	71 90	
49	45	45 00	51 72	
52	36	36 00	40 32	
56	24	24 00	25 95	
60	12	12 00	12 46	

No. 58. SAN FRANCISCO.

OCCIDENTAL LOAN ASSOCIATION.

(Incorporated August 26, 1885.)

BENJ. M. STICH, Secretary. S. CAMPBELL, President.

Fiscal year ended September 4, 1917.

No. of series, 10. No. of members and investors, 56. No. of shares, 442.

Assets.		
Loans, on mortgages, $36,000; on mortgages, flat, $10,285.27; on shares, $7,000; on contract sales, $4,835.45		$58,120 72
Arrearages—		
On shares	$1,238 00	
On interest	1,149 35	
On premium	542 15	
		2,929 50
Cash in bank		3,372 60
Real estate owned		1,172 16
Advances, ledger accounts		13,446 30
Total assets		$79,041 28

Liabilities.	
Installment shares, dues	$26,400 00
Installment shares, profits	7,462 82
Overdrafts and bills payable	22,950 00
Reserve and undivided profits	22,066 16
Sundry ledger accounts	162 30
Total liabilities	$79,041 28

Receipts for Fiscal Year.	
Balance from last report	$4,645 20
Installment shares, dues	5,580 00
Interest	4,760 00
Premiums	1,113 35
Fees	2 50
Loans repaid	13,314 55
Overdrafts and bills payable	500 00
Advances repaid, personal accounts	9,886 59
All other receipts, real estate, etc.	5,645 93
Total receipts	$45,448 12

Disbursements for Fiscal Year.	
Overdrafts and bills payable	$3,000 00
Loans on mortgages and shares	7,947 26
Interest paid	1,392 00
Dues repaid, installment shares	4,206 00
Profits repaid, installment shares	2,010 18
Advances, personal accounts	17,637 98
Salaries	1,530 00
Taxes	485 10
Other expenses	201 59
All other disbursements, real estate, etc.	3,665 41
Balance, cash in office and bank	3,372 60
Total disbursements	$45,448 12

Installment Shares, With Age, Value, and Withdrawal Value.

Serial No.	Age in months	Total dues per share	Book value per share	Withdrawal value
23	120	$120 00	$182 97	$167 22
24	108	108 00	156 72	142 10
25	96	96 00	132 88	119 97
26	84	84 00	111 10	100 26
27	72	72 00	91 07	82 84
28	60	60 00	72 60	66 30
29	48	48 00	55 64	51 82
30	36	36 00	40 09	38 04
31	24	24 00	25 17	24 88
32	12	12 00	12 45	12 22

No. 59. SAN FRANCISCO.

PACIFIC LOAN ASSOCIATION.

(Incorporated December 8, 1884.)

BENJ. M. STICH, Secretary. B. M. GUNZBURGER, President.

Fiscal year ended December 5, 1917.

No. of series, 8. No. of members and investors, 45. No. of shares, 157.

Assets.		
Loans, on mortgages, $16,380; on contract sales, $5,586.35		$21,966 35
Arrearages—		
On shares	$371 00	
On interest	320 75	
On premium	180 31	
		872 06
Cash, in office, $126.40; in bank, $285.53		411 93
Real estate owned		13,140 95
Advances, ledger accounts		1,450 49
Total assets		$37,841 78

Liabilities.	
Installment shares, dues	$9,780 00
Intsallment shares, profits	2,341 22
Overdrafts and bills payable	17,521 01
Reserve and undivided profits	8,152 51
Sundry ledger accounts	47 04
Total liabilities	$37 841 78

Receipts for Fiscal Year.	
Balance from last report	$542 26
Installment shares, dues	2,395 00
Interest	1,869 72
Premiums	529 09
Fees	1 10
Loans repaid	1,919 58
Overdrafts and bills payable	12,476 85
Advances repaid, personal accounts	473 00
All other receipts, real estate, etc.	5,657 51
Total receipts	$25,863 91

Disbursements for Fiscal Year.	
Overdrafts and bills payable	$6,755 84
Loans on mortgages and shares	1,207 35
Interest paid	452 60
Dues repaid, installment shares	5,426 00
Profits repaid, installment shares	2,075 79
Advances, personal accounts	1,372 07
Salaries	1,260 00
Taxes	148 99
Other expenses	124 13
All other disbursements, real estate, etc.	6,629 21
Balance, cash in office and bank	411 93
Total disbursements	$25,863 91

Installment Shares, With Age, Value, and Withdrawal Value.

Serial No.	Age in months	Total dues per share	Book value per share	Withdrawal value
22	132	$132 00	$185 05	$171 78
23	120	120 00	161 91	151 43
24	108	108 00	140 55	130 78
28	60	60 00	70 22	65 11
29	48	48 00	53 74	50 87
30	36	36 00	39 12	37 56
31	24	24 00	25 33	24 66
32	12	12 00	12 32	12 16

No. 60. SAN FRANCISCO.

PACIFIC STATES SAVINGS AND LOAN COMPANY.

(Incorporated June 14, 1889.)

W. S. PARDY, Secretary. F. REIS, JR., President.

Fiscal year ended December 31, 1917.

No. of series, none. No. of members and investors, 2,173. No. of shares, 4,044.

Assets.		Liabilities.	
Loans, on mortgages, $280,022.58; on definite contract, $914,945.80; on shares, $3,435	$1,198,403 38	Paid-up and prepaid shares, capital	$201,550 00
Arrearages— On certificates $4,298 00; On interest 5,391 03	9,689 03	Paid-up and prepaid shares, dividends	91,214 35
Cash, in office, $1,715.36; in bank, $70,332.91	72,048 27	Investment certificates, principal	815,875 42
Real estate owned	76,421 70	Investment certificates, dividends	143,062 85
Furniture and fixtures	300 00	Advance payments	7,457 55
Advances, ledger accounts	3,156 99	Reserve and undivided profits	169,683 59
Other assets, bonds, etc.	123,153 00	Loans due and incomplete	32,314 79
		Sundry ledger accounts	10,081 37
		All other liabilities, tax reserve, etc.	11,932 45
Total assets	$1,483,172 37	Total liabilities	$1,483,172 37

Receipts for Fiscal Year.		Disbursements for Fiscal Year.	
Balance from last report	$89,900 18	Loans on mortgages and shares	$571,755 48
Installment shares, dues	969 00	Dues repaid, installment shares	23,736 30
Investment certificates	229,529 31	Profits repaid, installment shares	9,766 25
Interest	110,514 15	Paid-up and prepaid shares, capital	6,360 00
Premiums	300 00	Paid-up and prepaid shares, dividends	20,151 00
Loans repaid	475,121 69	Investment certificates, principal	127,075 91
Advances repaid, personal accounts	18,279 92	Investment certificates, dividends	21,221 23
All other receipts, real estate, rents, etc.	23,993 71	Advances, personal accounts	15,866 91
		Salaries	16,225 00
		Taxes	2,381 95
		Other expenses	11,967 67
		All other disbursements, bonds, real estate, etc.	50,051 99
		Balance, cash in office and bank	72,048 27
Total receipts	$948,607 96	Total disbursements	$948,607 96

Installment Shares, With Age, Value, and Withdrawal Value.

Dayton plan.
Dues, 60 cents per share per month.
Dividend, last fiscal year, 7 per cent.
Book value, dues plus dividend.
Withdrawal value, dues plus profits as per by-laws.

No. 61. SAN FRANCISCO.

PROGRESS MUTUAL LOAN ASSOCIATION.

(Incorporated December 31, 1894.)

N. STEINBERGER, Secretary. JAMES A. WHITE, President.

Fiscal year ended December 31, 1917.

No. of series, 11. No. of members and investors, 129. No. of shares, 949.

Assets.	
Loans, on definite contract, $48,743.66; on shares, $2,850	$51,593 66
Cash in bank	562 34
Real estate owned	1,187 12
Total assets	$53,343 12

Liabilities.	
Installment shares, dues	$35,209 20
Installmetn shares, profits	8,454 23
Overdrafts and bills payable	7,500 00
Reserve and undivided profits	2,179 69
Total liabilities	$53,343 12

Receipts for Fiscal Year.	
Balance from last report	$936 55
Installment shares, dues	8,265 40
Interest	4,262 22
Fines	24 67
Fees	22 25
Loans repaid	20,686 69
Overdrafts and bills payable	19,000 00
Advances repaid, personal accounts	75 55
Total receipts	$53,273 33

Disbursements for Fiscal Year.	
Overdrafts and bills payable	$11,500 00
Loans on mortgages and shares	17,520 00
Interest paid	188 47
Dues repaid, installment shares	16,487 20
Profits repaid, installment shares	5,153 54
Advances, personal accounts	8 55
Salaries	1,293 00
Taxes	185 81
Other expenses	374 42
Balance, cash in office and bank	562 34
Total disbursements	$53,273 33

Installment Shares, With Age, Value, and Withdrawal Value.

Serial No.	Age in months	Total dues per share	Book value per share	Withdrawal value
14	120	$120 00	$161 90	$157 50
15	108	108 00	141 27	137 50
16	96	96 00	121 62	118 00
17	84	84 00	103 08	100 00
18	72	72 00	85 60	83
19	60	60 00	60 19	67 50
20	48	48 00	53 76	52 75
21	36	36 00	39 18	38 50
22	24	24 00	25 40	25 00
23	12	12 00	12 36	12 25

No. 62. SAN FRANCISCO.

PROVIDENT MUTUAL LOAN ASSOCIATION.

(Incorporated September 24, 1887.)

N. Steinberger, Secretary. James Rolph, President.

Fiscal year ended September 30, 1917.

No. of series, 10. No. of members and investors, 270. No. of shares, 3,171.

Assets.		
Loans, on definite contract, $153,211.03; on shares, $2,140		$155,351 03
Arrearages—		
On shares	$63 70	
On interest	582 93	
		646 63
Cash in bank		11,107 17
Real estate owned		1,436 89
Furniture and fixtures		200 00
Advances, ledger accounts		700 91
Total assets		$169,442 63

Liabilities.	
Installment shares, dues	$128,047 20
Installment shares, profits	32,763 13
Reserve and undivided profits	7,905 00
Loans due and incomplete	667 30
All other liabilities, tax reserve	60 00
Total liabilities	$169,442 63

Receipts for Fiscal Year.	
Balance from last report	$12,372 93
Installment shares, dues	27,782 00
Interest	13,249 80
Fines	69 91
Fees	51 25
Loans repaid	59,315 13
Overdrafts and bills payable	57,500 00
Advances repaid, personal accounts	228 73
Total receipts	$170,569 75

Disbursements for Fiscal Year.	
Overdrafts and bills payable	$57,500 00
Loans on mortgages and shares	51,132 70
Interest paid	452 38
Dues repaid, installment shares	34,342 80
Profits repaid, installment shares	11,977 56
Advances, personal accounts	347 25
Salaries	2,690 00
Taxes	389 53
Other expenses	600 86
All other disbursements, fixtures, etc.	29 50
Balance, cash in office and bank	11,107 17
Total disbursements	$170,569 75

Installment Shares, With Age, Value, and Withdrawal Value.

Serial No.	Age in months	Total dues per share	Book value per share	Withdrawal value
23	120	$120 00	$168 30	$168 30
24	108	108 00	146 53	146 53
25	96	96 00	125 96	121 00
26	84	84 00	106 55	101 60
27	72	72 00	88 30	83 75
28	60	60 00	71 08	67 50
29	48	48 00	54 94	52 80
30	36	36 00	39 81	38 70
31	24	24 00	25 66	25 20
32	12	12 00	12 42	12 25

No. 63. SAN FRANCISCO.

UNION LOAN ASSOCIATION.

(Incorporated May 6, 1881.)

B. M. GUNZBURGER, Secretary. H. DEDERKY, JR., President.

Fiscal year ended May 7, 1918.

No. of series, 10. No. of members and investors, 69. No. of shares, 328.

Assets.

Loans, on mortgages, $25,600; on shares, $1,150; on contract sales, $6,264.07		$33,014 07
Arrearages—		
On shares	$560 85	
On interest	664 42	
On premium	427 59	
		$1,652 86
Cash, in office, $508.90; in bank, $3,784.67		4,293 57
Real estate owned		2,194 94
Advances, ledger accounts		694 74
Total assets		$41,850 18

Liabilities.

Installment shares, dues	$13,908 00
Installment shares, profits	2,885 40
Overdrafts and bills payable	12,575 00
Reserve and undivided profits	11,802 87
All other liabilities, suspense	678 91
Total liabilities	$41,850 18

Receipts for Fiscal Year.

Balance from last report	$6,022 40
Installment shares, dues	4,636 15
Interest	3,267 58
Premiums	961 36
Fees	2 70
Loans repaid	6,682 98
Overdrafts and bills payable	5,000 00
Advances repaid, personal accounts	161 20
All other receipts, real estate, etc.	606 31
Total receipts	$27,340 68

Disbursements for Fiscal Year.

Overdrafts and bills payable	$7,150 00
Loans on mortgages and shares	4,493 94
Interest paid	559 62
Dues repaid, installment shares	4,505 00
Profits repaid, installment shares	1,501 29
Advances, personal accounts	459 82
Salaries	1,230 00
Taxes	385 12
Other expenses	264 63
All other disbursements, real estate, etc.	2,497 69
Balance, cash in office and bank	4,293 57
Total disbursements	$27,340 68

Installment Shares, With Age, Value, and Withdrawal Value.

Serial No.	Age in months	Total dues per share	Book value per share	Withdrawal value
28	120	$120 00	$173 88	$160 41
29	108	108 00	149 55	137 08
30	96	96 00	127 02	116 16
31	84	84 00	106 54	97 52
32	72	72 00	87 67	80 62
33	60	60 00	70 29	65 14
34	48	48 00	54 26	51 13
35	36	36 00	39 44	37 72
36	24	24 00	25 52	24 76
37	12	12 00	12 39	12 19

No. 64. SAN FRANCISCO.

WESTERN LOAN ASSOCIATION.

(Incorporated November 12, 1886.)

BENJ. M. STICH, Secretary. FRANK R. DANN, President.

Fiscal year ended November 19, 1917.

No. of series, 10. No. of members and investors, 74. No. of shares, 543.

Assets.		
Loans, on mortgages, $41,900; on shares, etc., $3,500; on contract sales, $6,928.62		$52,328 62
Arrearages—		
On shares	$1,820 00	
On interest	1,882 39	
On premium	715 00	
		4,417 39
Cash, in office, $496.12; in bank, $955.93		1,452 05
Real estate owned		21,630 72
Advances, ledger accounts		1,405 11
Total assets		$81,233 89

Liabilities.	
Installment shares, dues	$39,324 00
Installment shares, profits	12,890 65
Overdrafts and bills payable	15,500 00
Reserve and undivided profits	13,398 90
Sundry ledger accounts	120 34
Total liabilities	$81,233 89

Receipts for Fiscal Year.	
Balance from last report	$2,361 37
Installment shares, dues	6,198 00
Interest	4,177 62
Premiums	1,106 20
Fees	1 30
Loans repaid	20,948 29
Overdrafts and bills payable	5,000 00
Advances repaid, personal accounts	756 01
All other receipts, real etsate, etc.	2,056 35
Total receipts	$42,605 14

Disbursements for Fiscal Year.	
Overdrafts and bills payable	$5,000 00
Loans on mortgages and shares	6,735 36
Interest paid	840 00
Dues repaid, installment shares	3,059 00
Profits repaid, installment shares	1,417 29
Advances, personal accounts	1,238 54
Salaries	1,560 00
Taxes	700 68
Other expenses	247 04
All other disbursements, real estate, etc.	20,355 18
Balance, cash in office and bank	1,452 05
Total disbursements	$42,605 14

Installment Shares, With Age, Value, and Withdrawal Value.

Serial No.	Age in months	Total dues per share	Book value per share	Withdrawal value
22	120	$120 00	$181 34	$166 01
23	168	108 00	155 24	141 06
24	96	96 00	131 40	119 01
25	84	84 00	109 73	99 43
26	72	72 00	89 98	81 88
27	60	60 00	71 92	65 96
28	48	48 00	55 34	51 67
29	36	36 00	40 01	38 00
30	24	24 00	25 77	24 88
31	12	12 00	12 45	12 22

No. 65. SAN JOSE.

MUTUAL BUILDING AND LOAN ASSOCIATION.

(Incorporated March 12, 1889.)

RALPH E. SANDERS, Secretary. GEO. E. GRAFT, President.

Fiscal year ended December 31, 1917.

No. of series, none. No. of members and investors, 1,027. No. of shares, 4,357.

Assets.	
Loans, on definite contract, $769,258.75; on shares, $6,827; on contract sales, $37,762.06	$813,847 81
Cash, in office, $75; in bank, $25,265.46	25,340 46
Real estate, owned	27,406 89
Furniture and fixtures	2,539 20
Other assets, Liberty Bonds	10,000 00
Total assets	$879,134 36

Liabilities.	
Installment shares, dues	$152 006 39
Installment shares, profit	58,707 65
Paid-up and prepaid shares, capital	590,410 00
Paid-up and prepaid shares, dividends	18,877 42
Investment certificates, principal	24,109 50
Reserve and undivided profits	23,827 27
Loans due and incomplete	11,034 54
Sundry ledger accounts	161 59
Total liabilities	$879,134 36

Receipts for Fiscal Year.	
Balance from last report	$9,138 21
Installment shares, dues	59,846 33
Paid-up and prepaid shares, dues	335,075 00
Investment certificates	39,361 50
Interest	64,154 49
Loans repaid	218,669 91
Overdrafts and bills payable	157,500 00
Advances repaid, personal accounts	94 18
All other receipts, real estate, etc.	20,906 44
Total receipts	$904,746 06

Disbursements for Fiscal Year.	
Overdrafts and bills payable	$157,500 00
Loans on mortgages and shares	173,133 86
Interest paid	1,452 20
Dues repaid, installment shares	293,322 26
Profits repaid, installment shares	32,483 67
Paid-up and prepaid shares, capital	82,900 00
Paid-up and prepaid shares, dividends	24,726 92
Investment certificates, principal	51,271 00
Salaries	7,825 00
Taxes	1,341 66
Other expenses	4,562 68
All other disbursements, real estate, bonds, etc.	48,886 35
Balance, cash in office and bank	25,340 46
Total disbursements	$904,746 06

Installment Shares, With Age, Value, and Withdrawal Value.

Dayton plan.
Dues, $1.00 per share per month.
Dividend, last fiscal year, 5½ per cent.
Book value, dues plus dividend.
Withdrawal value, full book value.

No. 66. SAN JOSE.

NUCLEUS BUILDING AND LOAN ASSOCIATION.

(Incorporated March 28, 1889.)

C. H. JOHNSON, Secretary. GEO. B. MCKEE, President.

Fiscal year ended April 2, 1918.

No. of series, none. No. of members and investors, 419. No. of shares, 4,838.

Assets.		Liabilities.	
Loans, on definite contract	$301,238 33	Installment shares, dues	$231,344 40
Arrearages, on interest	1,479 96	Installment shares, profits	38,093 60
Cash, in office, $730.39; in bank, $4,204.91	4,935 30	Paid-up and prepaid shares, capital	27,500 00
Furniture and fixtures	350 00	Paid-up and prepaid shares, dividends	677 50
Advances, ledger accounts	18 27	Reserve and undivided profits	6,094 08
		Loans due and incomplete	4,312 28
Total assets	$308,021 86	Total liabilities	$308,021 86

Receipts for Fiscal Year.		Disbursements for Fiscal Year.	
Balance from last report	$14,173 64	Loans on mortgages and shares	$99,491 27
Installment shares, dues	92,346 94	Dues repaid, installment shares	46,224 39
Paid-up and prepaid shares, dues	5,500 00	Profits repaid, installment shares	7,360 58
Interest	18,828 98	Paid-up and prepaid shares, capital	5,800 00
Loans repaid	33,868 07	Paid-up and prepaid shares, dividends	1,452 45
All other receipts, real estate, etc.	3,751 50	Advances, personal accounts	18 27
		Salaries	2,063 00
		Taxes	295 35
		Other expenses	540 47
		All other disbursements, real estate, etc.	288 05
		Balance, cash in office and bank	4,935 30
Total receipts	$168,469 13	Total disbursements	$168,469 13

Installment Shares, With Age, Value, and Withdrawal Value.

Dayton plan.
Dues, $1.00 per share per month.
Dividend, last fiscal year, 6 per cent.
Book value, dues plus dividend.
Withdrawal value, full book value.

No. 67. SAN JOSE.

SAN JOSE BUILDING AND LOAN ASSOCIATION.

(Incorporated January 30, 1885.)

W. M. SONTHEIMER, Secretary. V. KOCH, President.

Fiscal year ended December 30, 1917.

No. of series, none. No. of members and investors, 763. No. of shares, 13,728.

Assets.		
Loans, on mortgages, $497,695; on contract sales, $7,109.13		$504,804 13
Arrearages—		
On interest	$1,406 41	
On fines	33 70	
		1,440 11
Cash, in office, $635.41; in bank, $17,788.92		18,424 33
Real estate owned (office building, $17,703.42)		23,078 89
Furniture and fixtures		688 30
Advances, ledger accounts		329 11
Other assets, Liberty Bonds		11,000 00
Total assets		$559,764 87

Liabilities.	
Installment shares, dues	$428,301 24
Installment shares, profits	58,068 92
Paid-up and prepaid shares, capital	4,000 00
Investment certificates, principal	53,234 58
Investment certificates, dividends	766 13
Reserve and undivided profits	15,211 40
Loans due and incomplete	182 60
Total liabilities	$559,764 87

Receipts for Fiscal Year.	
Balance from last report	$4,778 92
Installment shares, dues	163,920 58
Investment certificates	25,467 58
Interest	41,505 91
Fines	270 30
Loans repaid	130,304 17
Overdrafts and bills payable	11,500 00
Advances repaid, personal accounts	1,450 91
All other receipts, real estate, etc.	11,578 48
Total receipts	$390,776 85

Disbursements for Fiscal Year.	
Overdrafts and bills payable	$11,500 00
Loans on mortgages and shares	92,578 62
Interest paid	195 60
Dues repaid, installment shares	179,258 77
Profits repaid, installment shares	15,110 53
Paid-up and prepaid shares, dividends	200 00
Investment certificates, principal	17,920 00
Investment certificates, dividends	2,491 08
Advances, personal accounts	1,613 88
Salaries	4,060 00
Taxes	303 31
Other expenses	2,131 64
All other disbursements, real estate, bonds, etc.	44,989 09
Balance, cash in office and bank	18,424 33
Total disbursements	$390,776 85

Installment Shares, With Age, Value, and Withdrawal Value.

Dayton plan.
Dues 50 cents per share per month.
Dividend, last fiscal year, 5 per cent.
Book value, dues plus dividend.
Withdrawal value, full book value.

No. 68. SAN LUIS OBISPO.

SAN LUIS BUILDING AND LOAN ASSOCIATION.

(Incorporated March 1, 1888.)

M. LEWIN, Secretary. BENJ. BROOKS, President.

Fiscal year ended March 1, 1918.

No. of series, 16. No. of members and investors, 287. No. of shares, 2,601.

Assets.		
Loans, on mortgages, $164,630; on shares, $40; on contract sales, $564.75		$165,234 75
Arrearages—		
On shares	$186 00	
On interest	292 55	
On fines	108 85	
		587 40
Cash in bank		3,151 51
Advances, ledger accounts		85 66
Total assets		$169,059 32

Liabilities.	
Installment shares, dues	$130,446 00
Installment shares, profits	28,840 95
Paid-up and prepaid shares, capital	800 00
Paid-up and prepaid shares, dividends	27 60
Advance payments	3,265 00
Reserve and undivided profits	4,545 97
Sundry ledger accounts	95 28
All other liabilities, tax reserve	1,038 52
Total liabilities	$169,059 32

Receipts for Fiscal Year.	
Installment shares, dues	$31,889 00
Interest	14,252 92
Fines	174 47
Fees	46 23
Loans repaid	29,485 25
Advances repaid, personal accounts	409 39
All other receipts, real estate, etc.	1,330 50
Total receipts	$77,578 76

Disbursements for Fiscal Year.	
Overdrafts and bills payable	$99 15
Loans on mortgages and shares	33,465 00
Interest paid	416 78
Dues repaid, installment shares	28,477 00
Profits repaid, installment shares	8,489 28
Paid-up and prepaid shares, dividends	56 60
Advances, personal accounts	91 29
Salaries	1,686 43
Taxes	963 31
Other expenses	331 41
All other disbursements, fire loss, etc.	351 00
Balance, cash in office and bank	3,151 51
Total disbursements	$77,578 76

Installment Shares, With Age, Value, and Withdrawal Value.

Serial No.	Age in months	Total dues per share	Book value per share	Withdrawal value
19	120	$120 00	$168 31	$165 89
20	108	108 00	146 79	141 94
21	96	96 00	125 94	119 95
22	84	84 00	106 37	100 22
23	72	72 00	88 20	82 53
25	60	60 00	71 11	66 39
27	48	48 00	55 07	51 54
29	36	36 00	39 98	37 99
31	24	24 00	25 77	24 89
33	12	12 00	12 47	12 24

No. 69. SAN MATEO.

SAN MATEO MUTUAL BUILDING AND LOAN ASSOCIATION.

(Incorporated June 22, 1896.)

C. H. KIRKBRIDE, Secretary. WM. F. TURNBULL, President.

Fiscal year ended December 31, 1917.

No. of series, 40. No. of members and investors, 147. No. of shares, 1,284.

Assets.		
Loans, on mortgages, $91,825; on shares, $300		$92,125 00
Arrearages—		
On shares	$1,241 00	
On interest	1,100 00	
On fines	100 00	
		2,441 00
Cash in bank		4,552 42
Real estate owned		3,915 00
Furniture and fixtures		120 00
Advances, ledger accounts		1,020 67
Other assets, Liberty Bonds		1,500 00
Total assets		$105,674 09

Liabilities.	
Installment shares, dues	$55,647 00
Installment shares, profits	13,764 27
Paid-up and prepaid shares, capital	28,200 00
Paid-up and prepaid shares, dividends	835 50
Advance payments	342 00
Overdrafts and bills payable	1,357 00
Reserve and undivided profits	5,373 21
Loans due and incomplete	3 27
Sundry ledger accounts	2 90
All other liabilities	148 94
Total liabilities	$105,674 09

Receipts for Fiscal Year.	
Balance from last report	$2,874 82
Installment shares, dues	13,869 00
Paid-up and prepaid shares, dues	3,200 00
Interest	7,865 04
Premiums	234 88
Fines	123 00
Fees	39 25
Loans repaid	24,470 00
Overdrafts and bills payable	5,437 00
Advances repaid, personal accounts	87 65
All other receipts, real estate, etc.	4,285 40
Total receipts	$62,486 04

Disbursements for Fiscal Year.	
Overdrafts and bills payable	$10,255 00
Loans on mortgages and shares	15,933 03
Interest paid	495 87
Dues repaid, installment shares	18,644 00
Profits repaid, installment shares	5,845 18
Paid-up and prepaid shares, capital	1,200 00
Paid-up and prepaid shares, dividends	1,601 50
Advances, personal accounts	169 91
Salaries	1,382 00
Taxes	299 47
Other expenses	335 15
All other disbursements, bonds, real estate, etc.	1,772 51
Balance, cash in office and bank	4,552 42
Total disbursements	$62,486 04

Installment Shares, With Age, Value, and Withdrawal Value.

Serial No.	Age in months	Total dues per share	Book value per share	Withdrawal value
47	120	$120 00	$171 87	$168 43
51	108	108 00	149 14	146 16
55	96	96 00	127 99	125 23
59	84	84 00	107 79	105 63
63	72	72 00	89 09	87 31
67	60	60 00	71 63	70 20
71	48	48 00	55 30	64 19
75	36	36 00	40 04	39 24
79	24	24 00	25 28	25 26
83	12	12 00	12 46	12 21

No. 70. SAN RAFAEL.

MARIN COUNTY MUTUAL BUILDING AND LOAN ASSOCIATION.

(Incorporated July 19, 1886.)

L. A. LANCEL, Secretary. GEO. M. DODGE, President.

Fiscal year ended July 31, 1917.

No. of series, 19. No. of members and investors, 250. No. of shares, 3,130.

Assets.

Loans, on mortgages		$143,200 00
Arrearages—		
On shares	$105 00	
On interest	157 50	
On fines	13 15	
		275 65
Real estate owned		8,555 37
Advances, ledger accounts		63 70
Total assets		$152,094 72

Liabilities.

Installment shares, dues	$107,352 00
Installment shares, profits	24,548 90
Investment certificates, principal	8,550 00
Investment certificates, dividends	54 58
Advance payments	50 00
Overdrafts and bills payable	3,460 77
Reserve and undivided profits	7,478 47
Loans due and incomplete	600 00
Total liabilities	$152,094 72

Receipts for Fiscal Year.

Balance from last report	$1,068 00
Installment shares, dues	40,566 00
Investment certificates	3,000 00
Interest	13,943 70
Fines	156 17
Fees	93 60
Loans repaid	41,125 48
Overdrafts and bills payable	2,460 77
All other receipts, rents, etc.	295 46
Total receipts	$102,709 18

Disbursements for Fiscal Year.

Loans on mortgages and shares	$26,000 00
Interest paid	78 88
Dues repaid, installment shares	48,150 00
Profits repaid, installment shares	18,161 35
Investment certificates, principal	4,550 00
Investment certificates, dividends	421 40
Advances, personal accounts	24 50
Salaries	1,560 00
Taxes	241 45
Other expenses	416 60
All other disbursements, real estate, etc.	3,105 00
Total disbursements	$102,709 18

Installment Shares, With Age, Value, and Withdrawal Value.

Serial No.	Age in months	Total dues per share	Book value per share	Withdrawal value
29	114	$114 00	$184 25	$180 74
30	108	108 00	167 44	164 47
32	96	96 00	141 09	136 58
34	84	84 00	117 19	110 55
36	72	72 00	95 40	88 38
38	60	60 00	75 44	69 26
40	48	48 00	57 64	52 82
42	36	36 00	41 20	38 60
44	24	24 00	26 28	25 14
46	12	12 00	12 60	12 30

No. 71. SANTA ANA.

HOME MUTUAL BUILDING AND LOAN ASSOCIATION.

(Incorporated April 1, 1893.)

O. M. Robbins, Secretary. Frank Ey, President.

Fiscal year ended December 31, 1917.

No. of series, 24. No. of members and investors, 1,142. No. of shares, 5,637.

Assets.

Loans, on mortgages, $433,050; on definite contract, $50,702.51; on shares, $5,915		$489,667 51
Arrearages—		
On shares	$733 00	
On interest	895 60	
		1,628 60
Cash in bank		9,422 96
Real estate owned (office building)		19,582 77
Furniture and fixtures		384 76
Advances, ledger accounts		90 16
Total assets		$520,776 76

Liabilities.

Installment shares, dues	$252,051 00
Installment shares, profits	62,937 09
Investment notes, principal	184,410 00
Investment notes, dividends accrued	3,420 00
Advance payments	178 35
Reserve and undivided profits	17,339 67
Loans due and incomplete	440 65
Total liabilities	$520,776 76

Receipts for Fiscal Year.

Balance from last report	$28,953 63
Installment shares, dues	73,002 25
Investment notes	53,405 00
Interest	38,389 27
Fines	340 43
Fees	97 45
Loans repaid	127,747 49
Advances repaid, personal accounts	111 23
All other receipts, rents, etc.	1,229 24
Total receipts	$323,275 99

Disbursements for Fiscal Year.

Loans on mortgages and shares	$117,089 35
Dues repaid, installment shares	99,849 25
Profits repaid, installment shares	35,217 64
Investment notes, principal	45,240 00
Investment notes, dividends	10,710 47
Advances, personal accounts	99 26
Salaries	2,805 00
Taxes	860 64
Other expenses	1,512 37
All other disbursements, real estate and insurance	469 05
Balance, cash in office and bank	9,422 96
Total disbursements	$323,275 99

Installment Shares, With Age, Value, and Withdrawal Value.

Serial No.	Age in months	Total dues per share	Book value per share	Withdrawal value
22	120	$120 00	$180 75	$180 75
24	108	108 00	155 77	155 77
26	96	96 00	132 64	130 80
28	84	84 00	111 21	106 21
30	72	72 00	91 38	86 38
32	60	60 00	73 05	68 20
34	48	48 00	56 07	52 05
36	36	36 00	40 41	38 20
38	24	24 00	25 90	24 95
40	12	12 00	12 46	12 23

No. 72. SANTA BARBARA.

LOAN AND BUILDING ASSOCIATION.

(Incorporated May 23, 1887.)

J. M. ABBOTT, Secretary. HENRY L. STAMBACH, President.

Fiscal year ended June 30, 1918.

No. of series, 23. No. of members and investors, 531. No. of shares, 3,434.

Assets.

Loans, on mortgages, $422,987; on shares, $3,375		$426,362 00
Arrearages—		
On shares	$657 00	
On interest	607 42	
On fines	60 05	
		1,324 47
Cash, in office, $491.52; in bank, $5,017.07		5,508 59
Real estate owned		2,197 82
Furniture and fixtures		500 00
Advances, ledger accounts		920 11
Total assets		$436,812 99

Liabilities.

Installment shares, dues	$159,468 00
Installment shares, profits	31,153 23
Investment certificates, principal	237,900 00
Investment certificates, dividends	1,564 50
Advance payments	495 60
Reserve and undivided profits	6,136 81
Sundry ledger accounts	94 85
Total liabilities	$436,812 99

Receipts for Fiscal Year.

Balance from last report	$8,566 76
Installment shares, dues	45,986 00
Investment certificates	47,900 00
Interest	30,165 35
Premiums	140 25
Fines	494 26
Fees	66 40
Loans repaid	72,874 00
Advances repaid, personal accounts	1,759 89
All other receipts	11 60
Total receipts	$207,964 51

Disbursements for Fiscal Year.

Overdrafts and bills payable	$3,800 00
Loans on mortgages and shares	99,670 00
Dues repaid installment shares	31,987 00
Profits repaid, installment shares	7,729 91
Investment certificates, principal	37,700 00
Investment certificates, dividends	14,065 60
Advances, personal accounts	1,933 23
Salaries	1,462 50
Taxes	530 20
Other expenses	905 23
All other disbursements, real estate, etc.	2,672 25
Balance, cash in office and bank	5,508 59
Total disbursements	$207,964 51

Installment Shares, With Age, Value, and Withdrawal Value.

Serial No.	Age in months	Total dues per share	Book value per share	Withdrawal value
28	120	$120 00	$162 06	$162 06
30	108	108 00	141 67	141 67
32	96	96 00	122 04	122 04
34	84	84 00	103 56	103 56
36	72	72 00	86 07	86 07
38	60	60 00	69 54	69 54
40	48	48 00	53 95	53 95
42	36	36 00	39 33	39 33
44	24	24 00	25 53	25 53
46	12	12 00	12 40	12 40

No. 73. SANTA BARBARA.

SANTA BARBARA MUTUAL BUILDING AND LOAN ASSOCIATION.

(Incorporated May 20, 1901.)

J. M. Warren, Secretary. E. C. Roeder, President.

Fiscal year ended March 1, 1918.

No. of series, none. No. of members and investors, 1,089. No. of shares, 16,028.

Assets.	
Loans, on mortgages	$628,093 01
Arrearages, on interest	7,321 64
Cash in bank	81,231 73
Real estate owned	8,693 81
Advances, ledger accounts	3,389 28
Total assets	$728,729 47

Liabilities.	
Installment shares, dues	$558,541 33
Installment shares, profits	162,007 17
Reserve and undivided profits	5,000 00
Loans due and incomplete	3,180 97
Total liabilities	$728,729 47

Receipts for Fiscal Year.	
Balance from last report	$75,263 73
Installment shares, dues	151,039 41
Interest	43,548 15
Fees	58 50
Loans repaid	177,267 32
Advances repaid, personal accounts	269 97
All other receipts, real estate, etc.	712 17
Total receipts	$448,159 25

Disbursements for Fiscal Year.	
Loans on mortgages and shares	$192,186 97
Dues repaid, installment shares	149,993 44
Profits repaid, installment shares	15,337 87
Advances, personal accounts	3,659 25
Salaries	2,899 95
Taxes	834 62
Other expenses	1,974 60
All other disbursements	40 82
Balance, cash in office and bank	81,231 73
Total disbursements	$448,159 25

Installment Shares, With Age, Value, and Withdrawal Value.

Dayton plan.
Dues 50 cents per share per month.
Dividend, last fiscal year, 6 per cent.
Book value, dues plus dividend.
Withdrawal value, full book value.

No. 74. SANTA CLARA.

SANTA CLARA BUILDING AND LOAN ASSOCIATION.

(Incorporated March 19, 1889.)

F. O. Roll, Secretary. J. B. O'Brien, President.

Fiscal year ended March 31, 1918.

No. of series, 21. No. of members and investors, 289. No. of shares, 2,535.

Assets.		
Loans, on mortgages, $186,150; on shares, $475; on contract sales, $3,359.88		$189,984 88
Arrearages—		
On shares	$2,945 50	
On interest	4,057 05	
On fines	225 70	
		7,228 25
Cash in bank		7,106 43
Real estate owned		15,000 00
Other assets		110 50
Total assets		$219,430 06

Liabilities.	
Installment shares, dues	$145,438 50
Installment shares, profits	42,594 06
Paid-up and prepaid shares, capital	15,200 00
Paid-up and prepaid shares, dividends	152 00
Advance payments	134 40
Reserve and undivided profits	12,706 75
Loans due and incomplete	1,611 00
Sundry ledger accounts	1,189 00
All other liabilities, tax reserve	404 35
Total liabilities	$219,430 06

Receipts for Fiscal Year.	
Balance from last report	$7,142 64
Installment shares, dues	32,468 00
Interest	17,854 75
Fines	142 00
Loans repaid	55,006 37
Advances repaid, personal accounts	350 39
All other receipts, real estate, etc.	5,749 11
Total receipts	$118,713 26

Disbursements for Fiscal Year.	
Loans on mortgages and shares	$30,784 10
Dues repaid, installment shares	47,261 25
Profits repaid, installment shares	20,690 35
Paid-up and prepaid shares, capital	3,000 00
Paid-up and prepaid shares, dividends	744 95
Advances, personal accounts	141 89
Salaries	1,320 00
Taxes	2,578 94
Other expenses	251 85
All other disbursements, real estate, etc.	4,833 50
Balance, cash in office and bank	7,106 43
Total disbursements	$118,713 26

Installment Shares, With Age, Value, and Withdrawal Value.

Serial No.	Age in months	Total dues per share	Book value per share	Withdrawal value
23	120	$120 00	$177 18	$177 18
25	108	108 00	152 95	152 95
27	96	96 00	130 47	129 00
29	84	84 00	109 60	108 00
31	72	72 00	90 24	88 00
33	60	60 00	72 26	70 00
35	48	48 00	55 58	52 50
37	36	36 00	40 10	38 00
39	24	24 00	25 75	25 00
41	12	12 00	12 42	12 25

No. 75. SANTA CRUZ.

SANTA CRUZ COUNTY BUILDING AND LOAN ASSOCIATION.

(Incorporated May 20, 1908.)

GEO. W. WOOD, Secretary. GEO. W. STONE, President.

Fiscal year ended April 20, 1918.

No. of series, none. No. of members and investors, 60. No. of shares, 382.

Assets.		Liabilities.	
Loans, on definite contract	$35,446 46	Guarantee stock, capital	$21,700 00
Cash, in office, $73.95; in bank, $348.44	422 39	Guarantee stock, surplus	1,605 77
Real estate owned	916 77	Installment shares, dues	4,486 00
Furniture and fixtures	165 00	Installment shares, profits	1.584 97
		Paid-up and prepaid shares, capital	4,200 00
		Paid-up and prepaid shares, dividends	126 00
		Investment certificates, principal	713 27
		Investment certificates, dividends	247 99
		Reserve and undivided profits	642 12
		Sundry ledger accounts	21 26
		All other liabilities, unearned premiums	1,623 24
Total assets	$36,950 62	Total liabilities	$36,950 62

Receipts for Fiscal Year.		Disbursements for Fiscal Year.	
Balance from last report	$2,165 27	Overdrafts and bills payable	$2,500 00
Installment shares, dues	587 50	Loans on mortgages and shares	5,648 02
Investment certificates	26 24	Interest paid	28 40
Interest	2,196 27	Dividends on guarantee stock	651 00
Premiums	182 00	Dues repaid, installment shares	67 00
Fines	70 24	Profits repaid, installment shares	16 73
Fees	15 50	Paid-up and prepaid shares, capital	2,100 00
Loans repaid	5,232 38	Paid-up and prepaid shares, dividends	318 00
Overdrafts and bills payable	2,500 00	Investment certificates, principal	353 99
Advances repaid, personal accounts	1,253 77	Investment certificates, dividends	27 16
All other receipts	3 88	Advances, personal accounts	1,242 24
		Salaries	515 00
		Taxes	54 75
		Other expenses	282 11
		All other disbursements	6 26
		Balance, cash in office and bank	422 39
Total receipts	$14,233 05	Total disbursements	$14,233 05

Installment Shares, With Age, Value, and Withdrawal Value.

Dayton plan.
Dues 50 cents per share per month.
Dividend, last fiscal year, 7 per cent.
Book value, dues plus dividend.
Withdrawal value, dues plus 6 per cent for average time.

No. 76. SANTA PAULA.

SANTA PAULA BUILDING AND LOAN ASSOCIATION.

(Incorporated April 21, 1890.)

H. H. YOUNGKEN, Secretary. D. W. MOTT, President.

Fiscal year ended May 18, 1918.

No. of series, 18. No. of members and investors, 466. No. of shares, 7,253.

Assets.		
Loans, on mortgages, $502,700; on shares, $1,400		$504,100 00
Arrearages—		
On shares	$2,597 20	
On interest	2,135 66	
On fines	236 76	
		4,969 62
Cash in bank		2,772 02
Furniture and fixtures		1,866 74
Advances, ledger accounts		1,074 48
Other assets, street bonds, etc.		6,884 27
Total assets		$521,667 13

Liabilities.	
Installment shares, dues	$232,651 20
Installment shares, profits	44,720 09
Investment notes, principal	213,700 00
Advance payments	1,319 75
Overdrafts and bills payable	13,000 00
Reserve and undivided profits	11,300 00
Loans due and incomplete	4,976 09
Total liabilities	$521,667 13

Receipts for Fiscal Year.	
Balance from last report	$3,228 02
Installment shares, dues	80,058 10
Investment notes	63,850 00
Interest	40,076 19
Premiums	62 60
Fines	346 14
Fees	199 15
Loans repaid	149,200 00
Overdrafts and bills payable	18,000 00
Advances repaid, personal accounts	4,667 83
All other receipts, street bonds and real estate	4,666 41
Total receipts	$364,354 44

Disbursements for Fiscal Year.	
Overdrafts and bills payable	$10,000 00
Loans on mortgages and shares	151,394 52
Interest paid	150 84
Dues repaid, installment shares	83,935 75
Profits repaid, installment shares	21,182 48
Investment notes, principal	62,525 00
Investment notes, dividends	11,922 95
Advances, personal accounts	4,496 54
Salaries	3,684 67
Taxes	388 43
Other expenses	2,258 31
All other disbursements, street bonds, etc.	9,642 93
Balance, cash in office and bank	2,772 02
Total disbursements	$364,354 44

Installment Shares, With Age, Value, and Withdrawal Value.

Serial No.	Age in months	Total dues per share	Book value per share	Withdrawal value
19—A	120	$60 00	$90 68	$89 15
20—A	108	54 00	78 17	76 97
23—C	72	72 00	91 84	90 85
24—C	60	60 00	73 42	72 08
25—C	48	48 00	56 40	54 74
26—C	36	36 00	40 64	39 34
27—C	24	24 00	26 04	25 50
28—C	12	12 00	12 52	12 38

No. 77. SANTA ROSA.

SANTA ROSA BUILDING AND LOAN ASSOCIATION.

(Incorporated October 3, 1888.)

C. D. BARNETT, Secretary. D. P. ANDERSON, Vice-President.

Fiscal year ended October 31, 1917.

No. of series, 11. No. of members and investors, 250. No. of shares, 2,179.

Assets.		
Loans, on definite contract, $118,756.61; on shares, $3,285		$122,041 61
Arrearages—		
On shares	$56 90	
On interest	570 40	
		627 30
Cash in bank		12,117 02
Advances, ledger accounts		71 57
Other assets, bonds		1,020 00
Total assets		$135,877 50

Liabilities.	
Installment shares, dues	$84,063 60
Installment shares, profits	20,996 45
Investment certificates, principal	25,886 18
Advance payments	24 53
Reserve and undivided profits	4,398 84
Loans due and incomplete	507 90
Total liabilities	$135,877 50

Receipts for Fiscal Year.	
Balance from last report	$6,761 54
Installment shares, dues	18,110 40
Investment certificates	18,067 91
Interest	9,273 76
Fees	35 00
Loans repaid	49,098 67
Advances repaid, personal accounts	143 87
Total receipts	$101,491 15

Disbursements for Fiscal Year.	
Loans on mortgages and shares	$39,419 90
Interest paid	5 00
Dues repaid, installment shares	16,843 80
Profits repaid, installment shares	5,417 68
Investment certificates, principal	23,835 78
Investment certificates, dividends	1,417 35
Advances, personal accounts	136 47
Salaries	1,000 00
Taxes	124 37
Other expenses	153 78
All other disbursements, bonds	1,020 00
Balance, cash in office and bank	12,117 02
Total disbursements	$101,491 15

Installment Shares, With Age, Value, and Withdrawal Value.

Serial No.	Age in months	Total dues per share	Book value per share	Withdrawal value
20	120	$120 00	$166 31	$160 50
21	108	108 00	145 11	139 59
22	96	96 00	124 96	120 00
23	84	84 00	105 83	101 64
24	72	72 00	87 74	84 42
25	60	60 00	70 72	68 25
26	48	48 00	54 74	53 04
27	36	36 00	39 74	38 70
28	24	24 00	25 65	25 14
29	12	12 00	12 42	12 30

No. 78. SAUSALITO.

SAUSALITO MUTUAL LOAN ASSOCIATION.

(Incorporated December 1, 1887.)

J. J. Ross, Secretary. C. O. Sharpe, President.

Fiscal year ended October 31, 1917.

No. of series, 8. No. of members and investors, 106. No. of shares, 961.

Assets.			Liabilities.	
Loans, on mortgages, $29,575; on definite contract, $2,568.32; on contract sales, $3,508.92		$35,652 24	Installment shares, dues	$28,610 00
Arrearages—			Installment shares, profits	4,052 51
On shares	$278 00		Advance payments	10 00
On interest	185 38		Overdrafts and bills payable	2,000 00
		463 38	Reserve and undivided profits	3,957 30
Cash, in bank		54 95	All other liabilities, contingent profits	683 97
Real estate owned		3,143 21		
Total assets		$39,313 78	Total liabilities	$39,313 78

Receipts for Fiscal Year.		Disbursements for Fiscal Year.	
Balance from last report	$5,275 99	Overdrafts and bills payable	$3,021 45
Installment shares, dues	12,574 00	Loans on mortgages and shares	8,275 00
Interest	2,826 83	Interest paid	488 64
Fines	56 17	Dues repaid, installment shares	23,036 00
Fees	15 80	Profits repaid, installment shares	4,462 77
Loans repaid	14,280 73	Advances, personal accounts	810 88
Overdrafts and bills payable	5,021 45	Salaries	540 00
Advances repaid, personal accounts	24 73	Other expenses	167 60
All other receipts, real estate, etc.	881 59	All other disbursements, suspense	100 00
		Balance, cash in office and bank	54 95
Total receipts	$40,957 29	Total disbursements	$40,957 29

Installment Shares, With Age, Value, and Withdrawal Value.

Serial No.	Age in months	Total dues per share	Book value per share	Withdrawal value
25	72	$72 00	$91 60	
26	60	60 00	73 42	Dues plus profits as per by-laws.
27	48	48 00	56 38	
28	36	36 00	40 55	
29	24	24 00	26 00	
30	18	18 00	19 16	
31	12	12 00	12 52	
32	6	6 00	6 14	

No. 79. STOCKTON.

SAN JOAQUIN VALLEY BUILDING AND LOAN ASSOCIATION.

(Incorporated June 17, 1889.)

A. M. Noble, Secretary. S. N. Cross, President.

Fiscal year ended December 31, 1917.

No. of series, none. No. of members and investors, 1,953. No. of shares, 17,748.

Assets.	
Loans, on mortgages	$814,126 07
Arrearages, on interest	5,234 10
Cash in bank	44,118 46
Real estate owned	19,352 31
Advances, ledger accounts	2,694 56
Other assets	10 00
Total assets	$885,535 50

Liabilities.	
Installment shares, dues	$370,458 90
Installment shares, profits	99,802 60
Paid-up and prepaid shares, capital	310,654 51
Paid-up and prepaid shares, dividends	62,401 05
Reserve and undivided profits	38,000 00
Loans due and incomplete	4,218 44
Total liabilities	$885,535 50

Receipts for Fiscal Year.	
Balance from last report	$69,408 04
Installment shares, dues	146,438 01
Paid-up and prepaid shares, dues	81,071 20
Interest	62,701 39
Loans repaid	244,407 85
Overdrafts and bills payable	15,000 00
Advances repaid, personal accounts	1,429 43
All other receipts, real estate	3,864 25
Total receipts	$624,320 17

Disbursements for Fiscal Year.	
Overdrafts and bills payable	$15,000 00
Loans on mortgages and shares	304,062 41
Interest paid	182 15
Dues repaid, installment shares	143,915 23
Profits repaid, installment shares	23,138 52
Paid-up and prepaid shares, capital	45,718 76
Paid-up and prepaid shares, dividends	7,591 15
Advances, personal accounts	16,896 13
Salaries	6,670 00
Taxes	1,147 88
Other expenses	2,055 35
All other disbursements	13,824 13
Balance, cash in office and bank	44,118 46
Total disbursements	$624,320 17

Installment Shares, With Age, Value, and Withdrawal Value.

Dayton plan.
Dues, $1.00 per share per month.
Dividend, last fiscal year, 7.20 per cent.
Book value, dues plus dividend.
Withdrawal value, full book value.

No. 80. STOCKTON.

SECURITY BUILDING AND LOAN ASSOCIATION.

(Incorporated October 25, 1912.)

F. L. WILLIAMS, Secretary. E. S. VAN PELT, President.

Fiscal year ended December 31, 1917.

No. of series, none. No. of members and investors, 512. No. of shares, 250.

Assets.	
Loans, on definite contract, $266,072.56; on shares, $50; on contract sales, $5,479.98	$271,602 54
Cash, in office, $213.70; in bank, $20,217.01	20,430 71
Real estate owned	2,073 74
Furniture and fixtures	665 45
Advances, ledger accounts	1,072 74
Other assets	10 00
Total assets	$295,855 18

Liabilities.	
Guarantee stock, capital	$25,000 00
Guarantee stock, surplus	3,642 65
Investment certificates, principal	244,863 97
Loans due and incomplete	22,337 52
Sundry ledger accounts	11 04
Total liabilities	$295,855 18

Receipts for Fiscal Year.	
Balance from last report	$12,650 75
Investment certificates	145,825 20
Interest	18,913 02
Fees	487 00
Loans repaid	101,330 15
Overdrafts and bills payable	4,000 00
Advances repaid, personal accounts	2,005 60
All other receipts, real estate, etc.	2,544 49
Total receipts	$287,756 21

Disbursements for Fiscal Year.	
Overdrafts and bills payable	$4,000 00
Loans on mortgages and shares	176,945 95
Interest paid	58 00
Dividends on guarantee stock	1,500 00
Investment certificates, principal	61,725 85
Investment certificates, dividends	12,005 00
Advances, personal accounts	2,457 73
Salaries	2,125 00
Taxes	180 20
Other expenses	1,927 51
All other disbursements, real estate, etc.	4,400 26
Balance, cash in office and bank	20,430 71
Total disbursements	$287,756 21

Installment Shares, With Age, Value, and Withdrawal Value.

Dayton plan.
Dues 50 cents per share per month.
Dividend, last fiscal year, 6 per cent.
Book value, dues plus dividend.
Withdrawal value, full book value.

No. 81. STOCKTON.

STOCKTON LAND, LOAN AND BUILDING ASSOCIATION.

(Incorporated January 3, 1887.)

CHAS. E. LITTLEHALE, Secretary. C. M. JACKSON, President.

Fiscal year ended December 31, 1917.

No. of series, none. No. of members and investors, 1,037. No. of shares, 13,216.

Assets.	
Loans, on mortgages, $908,206.77; on shares, $14,800; on contract sales, $3,276.98	$926,283 75
Arrearages, on interest	3,236 80
Cash, in office, $4,008.09; in bank, $21,529.81	25,537 90
Real estate owned	2,752 66
Furniture and fixtures	800 00
Advances, ledger accounts	4,171 83
Other assets, Liberty Bonds	5,000 00
Total assets	$967,782 94

Liabilities.	
Installment shares, dues	$506,343 78
Installment shares, profits	198,468 34
Paid-up and prepaid shares, capital	196,800 00
Paid-up and prepaid shares, dividends	9,126 52
Reserve and undivided profits	45,618 31
Loans due and incomplete	10,325 99
Sundry ledger accounts	1,100 00
Total liabilities	$967,782 94

Receipts for Fiscal Year.	
Balance from last report	$60,016 45
Installment shares, dues	96,558 71
Paid-up and prepaid shares, dues	4,400 00
Interest	62,138 37
Fees	138 20
Loans repaid	173,341 72
Advances repaid, personal accounts	2,007 27
All other receipts, real estate, etc.	3,705 20
Total receipts	$402,305 92

Disbursements for Fiscal Year.	
Loans on mortgages and shares	$238,787 42
Interest rebate	81 95
Dues repaid, installment shares	61,099 08
Profits repaid, installment shares	28,283 12
Paid-up and prepaid shares, capital	20,600 00
Paid-up and prepaid shares, dividends	9,567 25
Advances, personal accounts	2,100 78
Salaries	3,770 00
Taxes	1,061 02
Other expenses	2,659 54
All other disbursements, bonds, real estate, etc.	8,757 86
Balance, cash in office and bank	25,537 90
Total disbursements	$402,305 92

Installment Shares, With Age, Value, and Withdrawal Value.

Dayton plan.
Dues, $1.00 per share per month.
Dividend, last fiscal year, 6¾ per cent.
Book value, dues plus dividend.
Withdrawal value, full book value.

No. 82. TULARE.

TULARE BUILDING AND LOAN ASSOCIATION.

(Incorporated January, 1889.)

J. L. WILDER, Secretary. A. W. WHEELER, President.

Fiscal year ended December 31, 1917.

No. of series, 21. No. of members and investors, 84. No. of shares, 703.

Assets.		
Loans, on mortgages		$48,930 00
Arrearages—		
On shares	$25 00	
On interest	19 00	44 00
Cash in bank		4,319 69
Real estate owned		150 00
Furniture and fixtures		200 00
Total assets		$53,643 69

Liabilities.	
Installment shares, dues	$40,318 00
Installment shares, profits	10,134 40
Advance payments	1,059 30
Overdrafts and bills payable	1,250 00
Reserve and undivided profits	773 68
Sundry ledger accounts	108 31
Total liabilities	$53,643 69

Receipts for Fiscal Year.	
Balance from last report	$9,158 00
Installment shares, dues	8,156 00
Interest	3,738 57
Fees	32 80
Loans repaid	5,175 00
Overdrafts and bills payable	3,000 00
Advances repaid, personal accounts	50 25
Total receipts	$29,310 62

Disbursements for Fiscal Year.	
Overdrafts and bills payable	1,750 00
Loans on mortgages and shares	17,185 00
Interest paid	82 59
Dues repaid, installment shares	3,975 00
Profits repaid, installment shares	993 42
Advances, personal accounts	70 25
Salaries	737 50
Taxes	126 72
Other expenses	70 45
Balance, cash in office and bank	4,319 69
Total disbursements	$29,310 62

Installment Shares, With Age, Value, and Withdrawal Value.

Serial No.	Age in months	Total dues per share	Book value per share	Withdrawal value
19	120	$120 00	$164 31	$153 23
21	108	108 00	143 16	134 37
23	96	96 00	123 36	116 52
24	84	84 00	104 52	99 39
26	72	72 00	86 98	83 23
28	60	60 00	70 28	65 14
30	48	48 00	54 59	51 30
32	36	36 00	39 71	37 85
33	24	24 00	25 65	24 82
35	12	12 00	12 42	12 21

No. 83. UPLAND.

MAGNOLIA MUTUAL BUILDING AND LOAN ASSOCIATION.

(Incorporated September 24, 1901.)

M. F. PALMER, Secretary. CHAS. RUEDY, President.

Fiscal year ended September 30, 1917.

No. of series, none. No. of members and investors, 470. No. of shares, 4,121.

Assets.	
Loans, on mortgages, $224,527; on shares, $3,500	$228,027 00
Arrearages, on interest	3,140 86
Cash, in office, $93.46; in bank, $10,284.92	10,378 38
Furniture and fixtures	240 00
Advances, ledger accounts	581 43
Total assets	$242,367 67

Liabilities.	
Installment shares, dues	$73,978 85
Installment shares, profits	22,369 80
Paid-up and prepaid shares, capital	134,800 00
Paid-up and prepaid shares, dividends	7,549 32
Advance payments	151 10
Reserve and undivided profits	3,518 60
Total liabilities	$242,367 67

Receipts for Fiscal Year.	
Balance from last report	$7,395 19
Installment shares, dues	18,863 86
Paid-up and prepaid shares, dues	38,100 00
Interest	17,296 49
Fines	391 01
Fees	127 25
Loans repaid	74,450 00
Overdrafts and bills payable	6,000 00
Advances repaid, personal accounts	842 12
All other receipts	5 00
Total receipts	$163,470 92

Disbursements for Fiscal Year.	
Overdrafts and bills payable	$8,500 00
Loans on mortgages and shares	55,477 00
Interest paid	65 84
Dues repaid, installment shares	32,086 84
Profits, repaid, installment shares	8,620 80
Paid-up and prepaid shares, capital	37,800 00
Paid-up and prepaid shares, dividends	7,671 26
Advances, personal accounts	464 95
Salaries	1,345 00
Taxes	235 70
Other expenses	505 29
All other disbursements, fixtures, etc.	319 86
Balance, cash in office and bank	10,378 38
Total disbursements	$163,470 92

Installment Shares, With Age, Value, and Withdrawal Value.

Dayton plan.
Dues, $1.00 per share per month.
Dividend, last fiscal year, 8 per cent.
Book value, dues plus dividend.
Withdrawal value, dues plus dividends as per by-laws.

No. 84. VALLEJO.

VALLEJO BUILDING AND LOAN ASSOCIATION.

(Incorporated October 26, 1911.)

J. R. WILSON, Secretary. J. B. MCCAULEY, President.

Fiscal year ended December 31, 1917.

No. of series, none. No. of members and investors, 27. No. of shares, 65.

Assets.		Liabilities.	
Loans, on definite contract	$10,346 82	Guarantee stock, capital	$4,159 00
Cash in bank	126 04	Investment certificates, principal	261 00
Other assets	50 00	Investment certificates, dividends	32 09
		Advance payments	16 70
		Overdrafts and bills payable	5,750 00
		Reserve and undivided profits	303 07
		Sundry ledger accounts	1 00
Total assets	$10,522 86	Total liabilities	$10,522 86

Receipts for Fiscal Year.		Disbursements for Fiscal Year.	
Balance from last report	$294 99	Overdrafts and bills payable	$450 00
Guarantee stock	53 00	Loans on mortgages and shares	3,156 80
Investment certificates	165 00	Interest paid	273 60
Interest	700 68	Advances, personal accounts	127 00
Fines	75	Taxes	27 53
Fees	5 60	Other expenses	24 50
Loans repaid	1,387 45	Balance cash in office and bank	126 04
Overdrafts and bills payable	1,450 00		
Advances repaid, personal accounts	128 00		
Total receipts	$4,185 47	Total disbursements	$4,185 47

Installment Shares, With Age, Value, and Withdrawal Value.

Dayton plan.
Dues 50 cents per share per month.
Dividend, last fiscal year, 6 per cent.
Book value, dues plus dividend.
Withdrawal value, full book value.

No. 85. VISALIA.

VISALIA BUILDING AND LOAN ASSOCIATION.

(Incorporated January 5, 1887.)

C. L. JOHNSON, Secretary. C. J. GIDDINGS, President.

Fiscal year ended January 31, 1918.

No. of series, none. No. of members and investors, 305. No. of shares, 6,684.

Assets.		Liabilities.	
Loans, on mortgages	$315,075 00	Installment shares, dues	$135,194 05
Arrearages, on interest	1,199 08	Installment shares, profits	62,630 05
Cash in bank	4,199 89	Paid-up and prepaid shares, capital	93,000 00
Furniture and fixtures	60 00	Paid-up and prepaid shares, dividends	2,790 00
Advances, ledger accounts	44 95	Overdrafts and bills payable	15,100 00
		Reserve and undivided profits	11,361 82
		Loans due and incomplete	50 00
		All other liabilities, interest on bills payable	453 00
Total assets	$320,578 92	Total liabilities	$320,578 92

Receipts for Fiscal Year.		Disbursements for Fiscal Year.	
Balance from last report	$21,415 07	Loans on mortgages and shares	$58,972 68
Installment shares, dues	35,872 71	Interest paid	972 04
Paid-up and prepaid shares, dues	1,700 00	Dues repaid, installment shares	51,931 70
Interest	25,856 11	Profits repaid, installment shares	23,425 15
Fees	173 00	Paid-up and prepaid shares, capital	18,400 00
Loans repaid	80,250 00	Paid-up and prepaid shares, dividends	6,606 67
Advances repaid, personal accounts	291 40	Advances, personal accounts	301 36
All other receipts, real estate	1,710 00	Salaries	1,800 00
		Taxes	417 81
		Other expenses	139 48
		All other disbursements	101 51
		Balance, cash in office and bank	4,199 89
Total receipts	$167,268 29	Total disbursements	$167,268 29

Installment Shares, With Age, Value, and Withdrawal Value.

Dayton plan.
Dues, 50 cents per share per month.
Dividend, last fiscal year, 8.7 per cent.
Book value, dues plus dividend.
Withdrawal value, full book value.

No. 86. WOODLAND.

NORTHERN CALIFORNIA BUILDING AND LOAN ASSOCIATION.

(Incorporated October 2, 1911.)

JAMES L. HARE, Secretary. HARRY L. HUSTON, President.

Fiscal year ended December 31, 1917.

No. of series, none. No. of members and investors, 27. No. of shares, 250.

Assets.		Liabilities.	
Loans, on definite contract, $30,650.53; on shares, $160	$30,810 53	Guarantee stock, capital	$10,638 30
Cash in bank	5,045 96	Guarantee stock, surplus	6,033 26
Furniture and fixtures	450 00	Investment certificates, principal	14,900 50
		Investment certificates, dividends	635 05
		Overdrafts and bills payable	2,500 00
		Loans due and incomplete	1,509 38
		All other liabilities	90 00
Total assets	$36,306 49	Total liabilities	$36,306 49

Receipts for Fiscal Year.		Disbursements for Fiscal Year.	
Balance from last report	$3,938 88	Loans on mortgages and shares	$17,790 62
Investment certificates	3,621 00	Investment certificates, principal	3,125 00
Interest	3,308 00	Investment certificates, dividends	612 02
Fees, loan	380 10	Salaries	420 00
Loans repaid	13,857 33	Taxes	74 79
Overdrafts and bills payable	2,500 00	Other expenses	648 70
All other receipts, insurance com.	111 78	Balance, cash in office and bank	5,045 96
Total receipts	$27,717 09	Total disbursements	$27,717 09

Installment Shares, With Age, Value, and Withdrawal Value.

Dayton plan.
Dues, 50 cents per share per month.
Dividend, last fiscal year, 6 per cent.
Book value, dues plus dividend.
Withdrawal value, full book value.

FOREIGN ASSOCIATION.

SALT LAKE CITY, UTAH.

WESTERN LOAN AND BUILDING COMPANY.

(Incorporated April, 1892.)

DR. JOHN T. WHITE, Secretary. P. W. MADSEN, President.

Statement of Conditions, July 13, 1918.

No. of series, 187. No. of shares, 150,783.

Assets.

Real estate loans (net)—		
California	$213,959 05	
Idaho	963,985 59	
Montana	498,702 76	
Miscellaneous	4,984 13	
Nevada	35,800 08	
Oregon	354,958 10	
Washington	145,565 44	
Wyoming	75,556 83	
Utah	488,560 19	
Total		$2,782,072 17
Stock loans		74.833 36
Real estate contract sales (net)		125,518 42
Cash in office		13,442 87
F. & S. bank balance		6,095 03
Office building, real estate		45,000 00
Reserve fund real estate, 77 pieces		7,700 00
Advances, insurance and taxes		14,176 37
Advances in foreclosure		12,713 63
Advances to agents		524 43
		$3,082,076 28

Liabilities.

Reserve fund capital		$200,000 00
General fund capital		100,000 00
Installment stock—		
"C"	$4,524 23	
"CC"	399,480 90	
"E"	205,052 15	
"F"	1,317,835 78	
"H"	268,183 08	
		2,195,076 14
"D" Full paid stock		36,400 00
"B" and "I" stock, prepaid		109,808 83
Savings stock		271,038 76
Extra payment stock		80,137 47
Coupons "D" stock		580 00
Sundry ledger accounts		22,610 17
Overdraft, Utah State National Bank		5,022 05
Agents commissions		124 50
Wyoming forfeiture account		1,119 37
Reserve fund real estate sold		56,770 00
Undivided profits		3,388 99
		$3,082,076 28

California Business.

Stock in force—		
"CC" 186 shares. Dues paid in		$9,334 76
"E" 1,268 shares. Dues paid in		14,550 48
"F" 5,616 shares. Dues paid in		72,933 66
"H" 137 shares. Dues paid in		3,434 42
7,207 shares. Dues paid in		$100,253 32
Mortgage loans, face value	$249,175 00	
Less repayments	35,215 95	
Net value	$213,959 05	
Loans on shares	1,012 78	
Real estate—9 pieces at $100 each	900 00	
Total California assets	$215,871 83	

Number of shareholders in California	500
Number of borrowers in California	75
Number of loans on deposit in California	58
Face value of same	$84,875 00
Less repayments	30,800 53
Net value	$54,074 47

ALL HONOR

is given to the men of the State Department of Engineering who have joined the colors in the

WAR FOR WORLD FREEDOM

To them is dedicated a SERVICE BANNER emblazoned with a star of valor for each, and in further expression of regard, their names are inscribed upon this

Roll of Honor

Captain HARRY H. BLEE, Aviation Service.
Captain J. BURDETTE BROWN, Engineers.
Lieutenant C. H. KROMER, Engineers.
Lieutenant FRANK E. WOOLDRIDGE, Infantry.
Lieutenant R. S. LAUGHLIN, Infantry, (**wounded**).
Lieutenant C. K. ALDRICH, Engineers.
Lieutenant HARRY H. ARMSTRONG, Engineers.
Ensign HARRY J. DEVINE, Navy.
Student Officer GEO. J. ADAMS, Officers' Training Corps.
Petty Officer P. W. DELONGCHAMPS, Navy.
Sergeant WARD DWAN, Infantry, (**wounded**).
Sergeant RAYMOND NUGENT, Infantry.
Sergeant THOMAS SWEENEY, Engineers.
Sergeant FRANK M. STEWART, Marines.
Corporal HAROLD MCMILLAN, Artillery.
Seaman W. K. DANIELS, Navy.
Private J. G. HEATH, Engineers.
Private W. K. BARTGES, Engineers.

Sixth Biennial Report

OF THE

Department of Engineering

OF THE

State of California

DECEMBER 1, 1916, TO NOVEMBER 30, 1918

CALIFORNIA STATE PRINTING OFFICE
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1918

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BIENNIAL REPORT OF THE DEPARTMENT OF ENGINEERING.

INTRODUCTION.

In presenting this, the sixth biennial report of the Department of Engineering, it is deemed proper to invite special attention of the Executive and the legislature to certain matters contained herein.

TO OUR DEFENDERS IN THE LIBERTY WAR THE FRONTISPIECE OF THIS VOLUME IS DEDICATED.

Every institution and organization, and well-nigh every family in the land, sent its best sons to the service of our country, and the Department of Engineering is proud of its men whose Service Stars shine forth upon its escutcheon.

Not less is the regard held for others who endeavored to join the colors but failed for reasons that were no fault of theirs. Many offered their services, which were declined, and two were accepted but fell ill on the eve of departure, the armistice being declared before they recovered.

All of those who answered the call were given indefinite leaves of absence with the assurance that their positions would be open for them when they return.

In addition to those who joined the colors, a number of the department's force went into special lines of industrial war work, so that altogether 46 per cent of the male force was released for war activities.

So large a depletion of the working force has necessarily caused some confusion, but the curtailment of building operations by restrictions placed thereon as war measures, and the united efforts of those remaining, have enabled the department to conduct its affairs with a good degree of efficiency.

In this connection it is desired to commend the loyalty of those who remained with the department and who assumed the duties of the missing ones and uncomplainingly performed extra work in order that their absent companions' vacant places should not be filled until the rightful claimants should return.

It is particularly urged upon the Executive and the legislature the desirability of providing means for giving our brave "boys" remunerative employment when they return to their old positions.

Another matter which gives the head of the department much gratification is the patriotic response made by the members of the department to all requests for financial aid in prosecuting the war. The donations to Red Cross, Y. M. C. A. and other war work calls have been generous.

It has been pointed out that the force was greatly reduced by war conditions, yet the department bought $38,950* of Liberty Bonds, being more than 30 per cent of the annual compensation of those purchasing. It should be remembered in this connection that salaries of state employees have not advanced with the high cost of living. Most of them are receiving the same compensation paid them long before the war, when living expenses were scarcely half of the present cost, and with some even the purchase of a small bond meant real sacrifices.

The development of the great valleys of California will probably receive great impetus after the war. Attention is invited to a discussion herein under the title of Conflict of Interests.

It is urged that the Department of Engineering be provided with means to immediately extend its research into matters that will assist in harmonizing warring industries.

It is being proposed in some quarters that the state inaugurate large colonization schemes to provide homes for returning soldiers. In this connection it is urged that if such is to be the policy of the state, close study be made of means of developing some of our vast areas of cheap desert lands.

There is need of careful investigation into proposed irrigation district enterprises, the extent of which is limited by lack of funds.

It is suggested that the Department of Engineering be given a fund for this purpose. It could be largely reimbursed by requiring a district after being organized to pay the expenses incurred.

Attention is invited to a clerical error in section 15*a* of the irrigation district law, as amended in 1917. The error should be corrected.

The cordial relations sustained between the department and the various offices of the state government, the several institutions and the many branches of the federal government with which co-operative work has been conducted, has been a source of personal satisfaction, and the State Engineer takes this opportunity of acknowledging the many courtesies received at the hands of all with whom dealings have been had.

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*In addition to this amount $4,450 of bonds were purchased by members away on "war leave," making the total amount $43,400.

PART I.

Sixth Biennial Report of the Department of Engineering of the State of California.

HISTORICAL.

The Department of Engineering was created by an act of the legislature approved March 11, 1907, chapter 183, statutes 1907, and was organized in the May following.

The act creating this department abolished the offices of Commissioner of Public Works, Auditing Board to the Commissioner of Public Works, Department of Highways and State Highway Commissioner, Lake Tahoe Wagon Road Commissioner, and Debris Commissioner, and delegated the performance of their several duties to the Department of Engineering. To the department was also assigned all engineering work for the Board of Harbor Commissioners of San Francisco and the design and construction of buildings and works for all the hospitals, prisons, schools and other state institutions. It was given authority to co-operate with the Department of the Interior and other departments and bureaus of the national government in making surveys, investigations, etc.

Mr. Nathaniel Ellery was appointed to the position of State Engineer and chief executive officer of the Department of Engineering, and assumed the office May 11, 1907. He was succeeded in office by the appointment of Mr. Wilbur F. McClure, incumbent, February 13, 1912.

The records of the organization of the department and the work accomplished by it from the date of its establishment to November 30, 1916, have been published in the reports heretofore issued every two years, and it is the purpose of this report to review the operations of the department during the biennial period just closing.

Since the department was created, each session of the legislature has enacted laws amending the statutes affecting the work of the department, the most notable of which have been the placing in the department the supervision of the design and construction of dams; the examination of proposed irrigation district projects and the supervision, with the bond commission, of the issue of irrigation district bonds thereunder; the administration of the state highway acts involving the expenditure of $33,000,000 for the construction of the state highways.

DEPARTMENT OF ENGINEERING.

Under the statutes now in force the Department of Engineering is composed of two bodies: Advisory Board and Executive Force. These two bodies are constituted respectively as follows:

THE ADVISORY BOARD.

Governor, ex officio member and chairman.

General Superintendent of State Hospitals, ex officio member.

Chairman of Board of State Harbor Commissioners of San Francisco, ex officio member.

State Engineer, appointed by the Governor, ex officio member.

Three members, appointed by the Governor.

The Advisory Board is the administrative head, and directs the operations of the department through the State Engineer, who is the chief executive officer of the department.

The ex officio members receive no salary as members of the Advisory Board. The three last-named appointed members of the Advisory Board are delegated as a special executive committee of the board to administer the state highways, and bear the title of State Highway Commission. These members are paid salaries.

EXECUTIVE FORCE.

This body is composed of two classes of employees, which for convenience are designated as ''statutory'' and ''nonstatutory'' employees. The first-named class are those enumerated by the laws which authorize the Department of Engineering to appoint the following:

Highway Engineer.
Chief Engineer for the Board of State Harbor Commissioners (San Francisco).
Two Assistant Engineers.
Secretary.
State Architect.
Assistant State Architect.
Auditor.
General Superintendent for the Architectural Division.
Mechanical Engineer.
Structural Engineer.
Electrical Engineer.
Architectural Designer.
Three Architectural Draftsmen.
Engineer's Draftsman.
Estimator.

Specification Writer.
Blueprint Pressman.
Two Clerks.
Two Stenographers.
Janitor.

These, with the State Engineer as Chief Executive Officer, comprise the ''statutory'' force. Their salaries are paid from the fund created by the ''General Appropriation Act.''

The field of operations of the Department of Engineering is so extensive and its activities so varied that the above-enumerated statutory force is not sufficient to properly conduct the work of the department and must be augmented by additional assistants appointed from time to time as exigencies arise requiring their services. Their compensation is paid, usually, from the appropriations made to cover the particular work for which they are engaged. When no such appropriation exists they are paid from the department's contingent fund.

The force of ''nonstatutory'' employees includes engineers and architects, designers, draftsmen, inspectors, etc., engaged in building operations; engineers, surveyors, inspectors and others required to design and construct waterworks and sewerage plants, etc., at the state institutions; engineers, surveyors, hydrographers, boatmen, foremen, cooks and laborers employed in control and improvement of river channels; engineers and special examiners to investigate bridges, dams and irrigation projects, together with an army of people engaged in the varied operations of the Highway Commission.

DUTIES OF THE DEPARTMENT.

The above list of employments indicates to some extent the varied nature of the department's activities and the extent of the field covered by it. Its duties, as specified by several statutes, are summarized as follows:

To make plans and specifications for all buildings at the various state institutions, to let contracts for and superintend their erection, or, in case satisfactory contracts can not be made, to construct the buildings by day labor. To design and install all heating, lighting, ventilating, refrigerating, water supply, sewerage, and mechanical plants of every nature—whether changes, extensions or original. Survey grounds, lay out walks, drives and roads; provide water supply, irrigation, reclamation, sewer and drainage systems, requiring the design and construction of dams, reservoirs, pipe lines, wells, pumping plants, ditches, sewage treatment and disposal plants and drains.

Design and construct works for the protection of river levees, preservation of navigation and protection from floods.

Conduct research looking to the reclamation of the overflow basins and to effect flood control on the Sacramento and San Joaquin and other rivers of the state.

Studies of the feasibility of navigable canals and canalization of rivers.

Through the engineering force assigned to the Board of Harbor Commissioners, to design and direct the construction of wharves, piers, buildings and their equipment on the water front of San Francisco.

Through the Highway Commission the construction and maintenance of the state highways authorized by the state highway bond acts, and the improvement, repair and maintenance of more than 600 miles of state roads in the mountains.

By co-operation with the federal government a topographic survey of the state is being made; daily measurements are made of the water flowing in all the principal and many of the minor streams of the state; studies of possibilities for developments of power in the mountains and irrigation in the plains. Investigation of the quantity of water required for various crops, methods of applying it, waste in the use of water, etc.

This department is required to co-operate with the engineers of the War Department in matters concerning debris control, flood control and aids to navigation.

Supplemental to the investigation of stream flow for flood control and utilization, the department is engaged in the determination of water stored in the great snow fields of the mountains and the study of meteorological phenomena affecting the run-off.

The State Engineer is required to investigate and pass upon the feasibility of the enterprise before an irrigation district can be organized, and as a member of the District Bond Commission approve plans and determine the cost of proposed works as bases for bond issues as well as the validation of bonds when issued; to keep a general supervision of construction of irrigation works executed under bond issues. Also to perform the same offices in connection with the issue of bonds by county water works districts.

He is ex officio a member of the State Water Commission, which body has control of all water appropriations and the ascertainment of water rights. He is also a member of the Carey Act Land Board.

The State Engineer is required by law to direct the engineering investigations for the Reclamation Board to determine the proper location and sufficiency of proposed reclamation works, so that they shall conform to the plan for the flood control adopted by the state.

Plans for all bridges to cross navigable streams are required to be approved by the State Engineer before they are permitted to be erected.

The law directs that he shall pass upon the plans, specifications and estimates of all dams constructed in the state.

In addition to the active duties enumerated above, the department conducts an extensive correspondence, answering queries from all over the country seeking information in regard to the extent of drainage, reclamation, irrigation and power developments, and many other lines of progress in the state, and the costs thereof. If the information is at hand or can be obtained it is always furnished. This is done upon the theory that all public offices should be in a measure publicity bureaus, and the dissemination of correct information as to the resources of the state and its advantages is a proper function of all branches of the government.

The department has been called upon by municipalities for advice in regard to sewage disposal; by communities asking for the examination of dams, as to their stability and safety, and specifications to strengthen the same, as well as advice regarding flood protection and stream control in different portions of the state. While these are not duties enjoined by law upon the department, the State Engineer has always responded to such requests and given such assistance in an advisory way as the department was able to furnish, and it is gratifying to know that such aid has been regarded of value by the recipients.

Since this country became involved in the great world-war, the State Engineer and the department have been called upon by state and federal officials for aid in matters connected with the prosecution of the war. Such work as the department can do is placed ahead of any other and its best energies utilized whenever called upon.

ORGANIZATION.

As previously stated, the department is divided into branches to handle each different kind of work. These branches are termed bureaus. The executive head of each bureau is called the director. He reports directly to the State Engineer.

The bureaus as now established are as follows:

I. General Office Bureau.
II. Bureau of Architecture.
III. Bureau of Economics.
IV. Bureau of Highways.

I. The General Office Bureau conducts the business of the department relating to all other branches, such as keeping the records and archives, accounts, contracts, claims and payments, legislation, janitor and messenger service, etc.

II. The Bureau of Architecture, as its name implies, designs and constructs all state buildings.

III. The Bureau of Economics has charge of all matters pertaining to hydraulics, such as irrigation, stream measurement, flood control, reclamation, drainage, and navigation.

Plans for water supply, for sewerage, irrigation, drainage and reclamation, roads and bridges, topographic surveys of grounds and surveys of land boundaries for all state institutions are entrusted to this bureau.

Supervision of dams and bridges is exercised through this bureau.

This bureau also has charge for the state of co-operative topographic surveys, hydrology, meteorology and irrigation investigations, debris control and inland navigation.

IV. That branch of the department designated herein as Bureau of Highways was created for the purpose of carrying out the highway bond acts.

This duty it has performed since 1911. In 1917, since the last report of the department was published, the office of state roads (having charge of the mountain roads) was transferred to this bureau.

The Highway Bureau has so large a task, requiring such a complete organization for one specific purpose, that it almost constitutes a separate department. It is, however, a part of the Department of Engineering and is administered through the direction of members of the Advisory Board delegated to that duty.

PERSONNEL.

At the date of this writing, November 1, 1918, the Department of Engineering is organized as follows:

ADVISORY BOARD.

William D. Stephens	Governor (Chairman)
W. F. McClure	State Engineer
Arthur Arlett	President State Board of Harbor Commissioners
F. W. Hatch	General Superintendent of State Hospitals
N. D. Darlington (chairman), Chas. F. Stern, ——— ———*	State Highway Commission

EXECUTIVE OFFICE.

NOTE.—Those whose names are followed by the letters (O. L.) are on leave serving with the colors. The letters (W. W.) following names indicates that the persons are on leave engaged in "war work" other than with the armed forces.

Title	Name	Entered service
State Engineer	W. F. McClure	Feb. 12, 1912
Secretary	Earle Freeman	Mar. 13, 1912

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*Henry J. Widenmann, died October 5, 1918.

GENERAL OFFICE BUREAU.

Secretary of Department — Director

Title	Name	Entered service
Division of correspondence—		
Secretary, chief.		
Stenographer	Lucy K. Adams	April 1, 1912
Stenographer	Henrietta Burt	May 16, 1913
Stenographer	Elsa Koch	Mar. 25, 1914
Telephone operator	Florence Lombard	Jan. 20, 1917
Messenger	Robert E. Hays	Dec. 31, 1917
Division of accounts—		
Auditor, chief.		
Auditor	J. H. Clarke	Nov. 11, 1911
Filing clerk	Chas. Johnston	July 8, 1907
Filing clerk	J. C. McCalmont	Mar. 26, 1912
Clerk	A. J. Adams	May 28, 1909
Clerk	Thos. McCully	Feb. 1, 1916
Clerk	F. M. Stewart (O. L.)	July 28, 1916
Clerk	N. E. White	April 15, 1912
Clerk	C. E. Thorp (W. W.)	Nov. 10, 1917
Clerk	J. W. Hickey	Oct. 17, 1917

BUREAU OF ARCHITECTURE.

State Architect ---------- Director
Assistant State Architect ---------- Superintendent

Title	Name	Entered service
Director's office—		
State Architect	George B. McDougall	Aug. 22, 1913
Assistant State Architect	Jas. S. Dean	Aug. 1, 1912
Clerk	Harold McMillan (O. L.)	Oct. 1, 1914
Blueprinter	Frank Butler	April 1, 1912
Architectural division—		
Assistant State Architect, chief.		
General inspector	J. W. Dutton, Jr.	Oct. 1, 1912
Chief architectural designer	Chas. F. Dean	Sept. 23, 1911
Architectural designer	R. E. Backus	Sept. 1, 1912
Architectural designer	A. R. Widdowson	July 17, 1911
Specification writer	C. K. Aldrich (O. L.)	Mar. 13, 1914
Estimator	I. C. Satterlee	July 17, 1914
Assistant estimator	Ward Dwan (O. L.)	Nov. 1, 1917
Chief architectural draftsman	Geo. J. Adams (O. L.)	Aug. 15, 1915
Architectural draftsman	Don M. Clippinger	May 15, 1918
Architectural draftsman	W. K. Daniels (O. L.)	Aug. 1, 1915
Architectural draftsman	P. W. DeLongchamps (O. L.)	Aug. 11, 1913
Architectural draftsman	H. J. Devine (O. L.)	Aug. 2, 1917
Architectural draftsman	E. Field (W. W.)	Aug. 1, 1917
Architectural draftsman	J. G. Heath (O. L.)	Feb. 1, 1913
Architectural draftsman	Walter J. Long	Nov. 12, 1912
Architectural draftsman	Carleton Pierson	Jan. 20, 1913
Architectural draftsman	C. E. Richardson (W. W.)	May 6, 1918
Architectural draftsman	Fred Ruckh (W. W.)	Mar. 17, 1914
Architectural draftsman	Leroy F. Sherwood	Jan. 1, 1913
Architectural draftsman	C. F. Strothoff	Aug. 2, 1917
Engineering division—		
General superintendent, chief.		
General superintendent	Luppe B. Luppen	Aug. 1, 1912
Structural engineer	Clarence H. Kromer (O. L.)	Feb. 16, 1913
Structural draftsman	Wm. K. Bartges (O. L.)	June 1, 1914
Structural draftsman	H. A. Smith (W. W.)	July 19, 1917
Structural draftsman	W. Wakeman (W. W.)	Feb. 2, 1918
Mechanical engineer		
Mechanical draftsman	A. L. Burleson (W. W.)	May 2, 1918
Mechanical draftsman	W. H. Epperson (W. W.)	Dec. 26, 1917
Mechanical draftsman	J. B. Hawley	July 12, 1915
Mechanical draftsman	C. A. Henderlong (W. W.)	April 28, 1914
Mechanical draftsman	E. H. Hogan (W. W.)	Mar. 4, 1914
Mechanical draftsman	M. W. Hulse (W. W.)	July 27, 1917
Mechanical draftsman	L. E. Rushton (W. W.)	July 6, 1915
Mechanical draftsman	P. H. Steiner (W. W.)	Oct. 19, 1914
Electrical engineer	G. M. Simonson	Sept. 22, 1913
Electrical draftsman	Andrew Eliason (W. W.)	Feb. 18, 1918
Electrical draftsman	F. H. Saeger (W. W.)	May 16, 1918
Electrical draftsman	Geo. N. Sargent	Aug. 1, 1917
Electrical draftsman	C. G. Zschockelt	June 30, 1915

BUREAU OF ECONOMICS.

Assistant State Engineer — Director

Title	Name	Entered service
Assistant State Engineer	Paul M. Norboe	May 17, 1907
Flood control and reclamation division—		
Assistant State Engineer, chief.		
Flood control engineer[1]	E. A. Bailey	June 1, 1912
Navigation division—		
Assistant State Engineer, chief.		
Chief engineer, San Francisco harbor[2]	Frank G. White	July 7, 1916
Hydrographer	Harry H. Armstrong (O. L.)	[3]June 26, 1918
Hydrographer	J. B. Brown (O. L.)	Feb. 1, 1916
Superintendent, river work	Clifford P. Childers	May 15, 1912
Foreman, river work	Raymond Nugent (O. L.)	Aug., 1914
Foreman, river work	Frank E. Wooldridge (O. L.)	Sept. 1, 1909
Clerk	Thomas Sweeney (O. L.)	April 20, 1914
Boat engineer	Orland W. Wallace	May 15, 1912
Helper	Harry Wicks	Dec., 1917
Cook	Hom Wo[4]	Nov. 2, 1914
Irrigation division—		
Assistant State Engineer, chief.		
Project examiner	W. L. Huber[5]	Occasional
Division of co-operative research—		
Assistant State Engineer, chief.		
U. S. Geological Survey—		
Topographic	George A. Davis	
Hydrographic	H. D. McGlashan	
U. S. Department of Agriculture—		
Irrigation inquiry	Frank Adams	
Division of institutional service—		
Assistant State Engineer, chief.	S. W. Curtis	Nov. 21, 1916
Engineer	Augustin J. Beakey	June 10, 1912
Engineer's draftsman	Edward D. Nickerson	April 18, 1914
Engineer's assistant	R. S. Laughlin (O. L.)	July 2, 1917
Engineer's assistant	Fred W. Hatch, Jr.	Dec., 1915
Road division[6]—		
Road engineer	Harry H. Blee (O. L.)	April 10, 1913

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[1] Assigned to duty with State Reclamation Board.

[2] Appointed Chief Engineer, San Francisco Harbor Commission, succeeding Jerome K. Newman, July 7, 1916.

[3] Transferred from Reclamation Board.

[4] Native American of Chinese parentage.

[5] Occasionally employed for special occasions.

[6] Office transferred to highways July 15, 1917, after Captain Blee received his commission.

The foregoing lists of employees constitute the permanent force required to conduct the ordinary routine work of the department, but does not include temporary appointments made in the several divisions at times when the work accumulates to a degree that can not be expeditiously disposed of by the regular force.

STATE INSTITUTIONS.

The state institutions for which the services of the Department of Engineering are required under the law, are as follows:

Educational.

Chico State Normal School.
Fresno State Normal School.
Humboldt State Normal School, Arcata.
Los Angeles State Normal School.
San Diego State Normal School.
San Francisco State Normal School.
San Jose State Normal School.
Santa Barbara State Normal School of Manual Arts and Home Economics.
San Luis Obispo State Polytechnic School.

Eleemosynary.

California School for the Deaf and the Blind, Berkeley.
Industrial Home of Mechanical Trades for Adult Blind, Oakland.
Pacific Colony, School for Feeble Minded (Authorized, not commenced).

State Hospitals.

Agnews, Agnew, Santa Clara County.
Mendocino, Ukiah, Mendocino County.
Napa, Napa, Napa County.
Norwalk, Norwalk, Los Angeles County.
Southern California, Patton, San Bernardino County.
Stockton, Stockton, San Joaquin County.
Sonoma State Home (for feeble-minded children), Eldridge, Sonoma County.

Punitive.

State Prison, Represa, Sacramento County.
State Prison, San Quentin, Marin County.

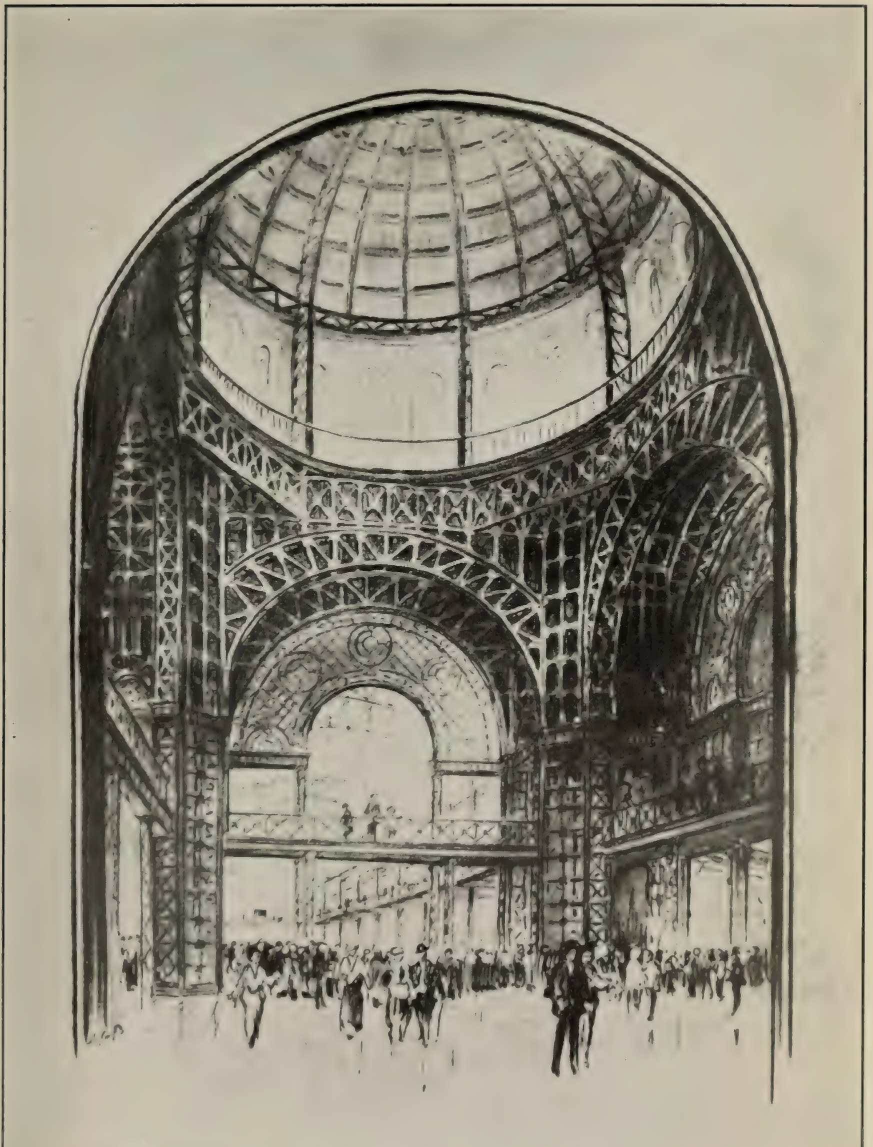
Reformatory.

Preston School of Industry, Ione, Amador County.
Whittier State School, Whittier, Los Angeles County.
California State School for Girls, Ventura, Ventura County.

Military.

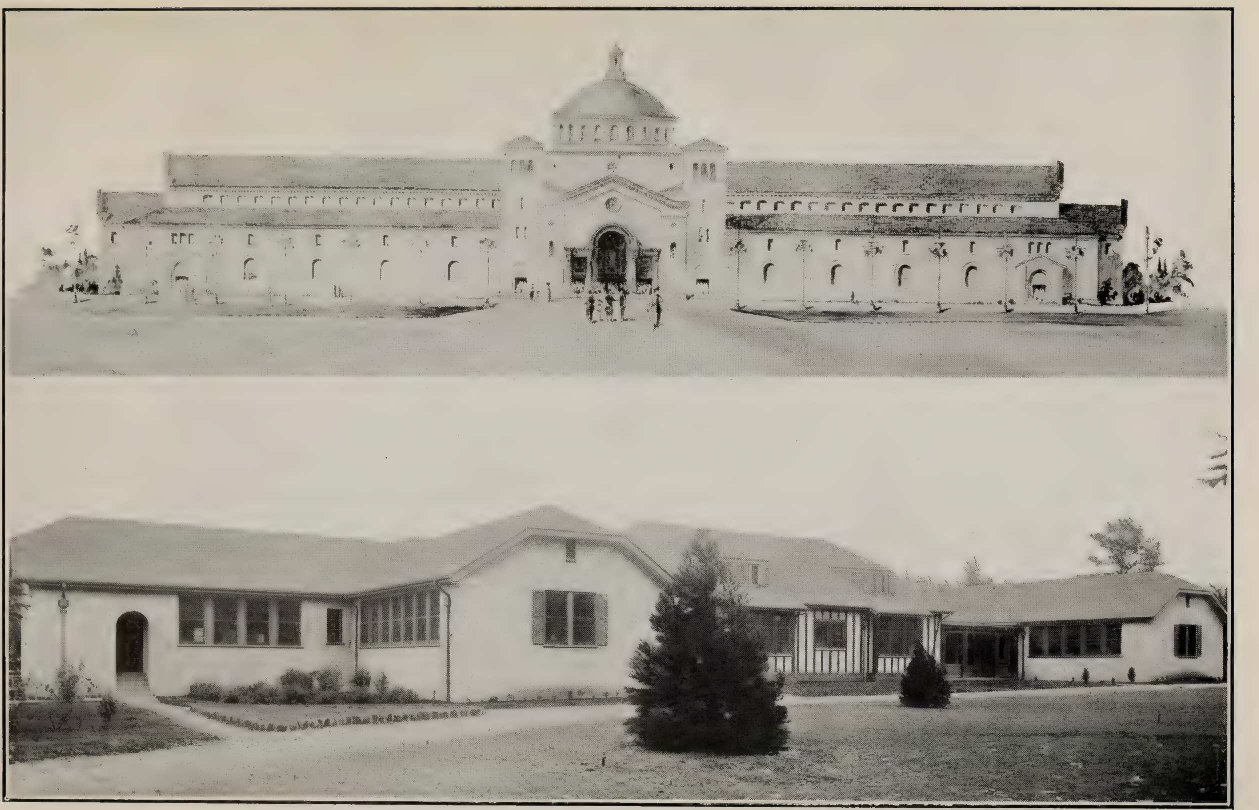
Veterans' Home, Yountville, Napa County.
State Arsenal and Armory, Sacramento.
State Armory, San Francisco.
State Armory, Los Angeles.
State Armory, Stockton.
State Armory, Naval Militia, San Diego.

PLATE I.



Exhibition Pavilion, interior, State Fair.

PLATE II.



Upper figure, Agricultural Pavilion, State Fair. Lower figure, Infirmary, Napa State Hospital.

Miscellaneous.

- State Capitol, building and grounds, Sacramento.
- Governor's Mansion, Sacramento.
- State Printing Office, Sacramento.
- State Fair, buildings and grounds, Sacramento.
- Sixth District Agricultural Fair, Los Angeles, buildings.
- Sutter's Fort, buildings and grounds, Sacramento.
- Marshall's Monument, building and grounds, Coloma.
- California Redwood Park, buildings and grounds, Santa Cruz County.
- Women's Relief Corps, buildings and grounds, San Jose.
- Harbor Front, wharves, piers and buildings, San Francisco.
- Mission Solano, Sonoma County (restoration).
- Old Russian Church, Fort Ross (restoration).
- Monterey Custom House and Old Theatre (restoration).
- State Fish and Game Commission, Hatcheries.
- State Mining Bureau, Buildings at Taft and Coalinga.
- Los Angeles Exposition Building.
- State Office Buildings, Sacramento (authorized, not commenced).
- State Office Buildings, San Francisco (authorized not commenced).

Architectural Service at State Institutions.

All work of the department pertaining to state buildings, whether relating to the preparation of plans and specifications, or erection and installation, including mechanical plants of every kind, is executed by the architectural bureau of the department, and a review of the work accomplished by that bureau will be found under the report of the State Architect.

Engineering Service at State Institutions.

Whenever improvements are contemplated at an institution, whether it be a new building, or whether water pipes, sewers, walks or drives are to be installed or extended, the first thing needed is a topographic map, showing the location of existing buildings and all the natural and artificial topographic features of the grounds. To meet this demand the department has from time to time executed surveys at several institutions and constructed maps thereof, so that now the department possesses such maps of many of the state institutions. Lack of funds, however, has prevented the prosecution of these surveys for all institutions. The absence of data furnished by such maps is keenly felt whenever the architects are called upon to design a new building, as its location and surroundings control or, at least, suggest the type of architectural appearance to be given to the building. The engineers who design the heating, water supply and sewage are greatly aided in their studies by accurate maps. The proper location of roads, drives and walks, and the arranging of scenic effects by the landscape artists are also better done when access is had to such data. The department has continued this line of work whenever funds were available and it is hoped that it soon will be able to make such maps of all institutions not yet surveyed and to bring those already made up to date.

Agnews State Hospital.

Drainage. The question of draining certain marsh lands at this institution has been discussed and recommended in former reports of the department. By a properly installed drainage system the productiveness of many acres would be greatly increased. During this year a start was made with a field at the north of the institution and about 1500 feet of open ditch constructed. This will carry off much surplus surface water, but to be fully effective should be supplemented with a complete system of lateral drains, preferably tiles.

Mendocino State Hospital.

Water Supply. The source of the water supply for this institution is a creek in the hills back of it. A stone masonry dam 27 feet high was constructed in the canyon several years ago, impounding about 8,000,000 gallons of water which is conveyed in a pipe to the hospital some 2½ miles away.

Within recent years this department has renewed the pipe line, and constructed another dam about half a mile up the creek from the old one. This dam, 63 feet high, built of concrete, creates a reservoir having a capacity of about 45,000,000 gallons. It was completed in the summer of 1916, and the reservoir has been filled each winter since, but as the creek does not flow in the summer, the storage of both reservoirs is barely sufficient for the needs of the hospital. During the summer just past, it being an abnormally dry season, the creek ceased to flow much earlier than usual, necessitating a lengthened period of draft upon the stored supply. The population of the institution was also increased by the assignment of many insane from the army and navy. As a consequence of the concurrence of circumstances named, the reservoirs were depleted before the rains came and resort was had to pumping from wells. A pipe line was laid from a well on the stock farm some 7000 feet to the hospital and the water pumped into an elevated steel tank. By this means and the practice of economy of use the water supply was made to suffice.

The experience of the past season indicates clearly that if the demands for water are to be allowed to increase, it will be imperative to obtain additional water at a very early date.

Napa State Hospital.

Water Supply. The water for domestic use and irrigation is obtained from three sources, viz, a storage reservoir in a canyon above the institution, from Spencer Creek and from wells on the grounds. This year a fourth supply was added.

The dam making the reservoir, which is called by the people at the hospital Lake Marie, was constructed several years ago. In 1916 it developed a leak which caused some alarm to the hospital management. An engineer from the department investigated it and concluded that no danger of failure impended. The water had been drawn down four feet below the full flow line at which point the leak ceased. It was decided that when the reservoir should again be filled and the leak started, exploratory excavations would be made to trace the escaping water to its origin, but unfortunately there has not been sufficient water to fill it.

The suffering of the inmates from insufficient water was quite marked in 1916, and led this department to recommend that steps be taken at once to secure an additional supply. The recommendation was met by an appropriation of $75,000 by the legislature in 1917, for that purpose.

The state owns a large tract of land in Napa Valley east of Yountville, known as the Fry Ranch. Rector Creek, a perennial stream with a minimum flow of more than 600,000 gallons a day, runs through the ranch and discharges into Napa River. Some years ago this department laid a pipe line conveying about 100,000 gallons a day of this water to the Veterans' Home at Yountville.

This source was selected for an auxiliary supply for the Napa State Hospital. A concrete diverting dam was constructed in the creek near the mouth of the rocky canyon and a pipe line laid to the hospital. The pipe is a wire-wound redwood stave pipe 10 and 6 inches internal diameter and 13½ miles in length. It is designed to resist heavy pressures and in places sustains a static head of 350 feet. The pipe was completed and began delivering water to the institution July 7 of this year, at the rate of 300,000 gallons a day.

The acquisition of this new source of water will provide an ample supply to meet the growing needs of the institution for some years.

The Tide Land Reclamation. The reclamation of 380 acres of tide lands along the Napa River, as related in previous reports has proved very effective and has added a large area to the productive farming lands of the hospital.

To further improve its productivity it was recommended in the last report that drainage be provided for the lowest portions where storm water run-off accumulates. This has now been accomplished by the construction of a system of dikes and ditches, and the installation of automatic tide-gates in the levees, supplemented by a small pumping plant to pump out the water accumulating below the influence of the tide gates.

Fry Ranch. This property was purchased by the state some years ago for a specific purpose, which purpose was later abandoned. It contains several hundred acres of very productive agricultural land, a portion of which is planted to alfalfa. It is now being used by the Napa State Hospital as a farm for the growing of produce for state institutions.

The water supply for domestic use is obtained from Rector Canyon Creek which traverses the property as described in the above discussion of additional water for the Hospital.

In conjunction with the work of constructing a pipe line from Rector Canyon to Napa State Hospital, the supply of domestic water to the Fry Ranch buildings was improved by constructing a 6-inch wood pipe about a mile long connecting the hospital pipe and the buildings of the ranch. The pressure at the fire mains is 130 pounds. It has already proved its worth in saving the buildings from fire this past summer.

A plant operating a 4-inch centrifugal pump was installed this year to pump water from Napa River to irrigate alfalfa in a field contiguous to the stream.

Sonoma State Home.

Water Supply. The water for domestic use at this institution is obtained from several springs in the wooded ravines of the hills in the western portion of the estate. The water, which is of most excellent quality, is conveyed in iron pipes to two concrete tanks of about 1,000,000 gallons capacity each, situated on a hill about 150 feet in elevation above the grounds of the home. From these tanks it is distributed to the buildings and grounds. One of these tanks developed serious leaks, which were attributed to earthquake shocks, and for some years has not been used.

For many years the springs furnished sufficient water for domestic purposes and also for irrigating the lawns, but with an increase in population the supply became inadequate.

In 1910 the department constructed an earthen dam across the lower end of a small valley in the hills about a mile back of the home, creating a reservoir with a capacity of about seventy-five acre-feet. The reservoir is called Fern Lake. A pipe line to the institution enables this water to be used for irrigation about the grounds, to supply fire hydrants, and also furnishes water for flushing purposes in some of the buildings. The quality of the water, however, renders it unfit for domestic use, and it is excluded from the domestic pipes.

A gas engine in the creek which traverses the estate pumps water through a pipe line to the dairy farm, where it is used for irrigating garden truck. Another pump in the creek bottom forces water to a small earthen reservoir on the hill above the buildings where it is admitted to the irrigation and fire mains on the Fern Lake system.

For a long time the domestic supply has not fully met the requirements of the institution in the summer months when the flow from the springs reaches its minimum and many attempts have been made to increase the flow by tunnels and cross-cuts, but without success. The department made careful investigation of the geologic formations and came to the conclusion that no material additional water supply could be developed from underground sources. This conclusion was verified two years ago when attempts were made to obtain water by deep wells bored at different points on the estate.

During the past summer engineers of the department have made reconnaisances of the mountains surrounding Sonoma Valley, and have found at least one site where it is believed a reservoir can be constructed which will store sufficient water to supply the Home with an abundance for all its purposes. The development of this supply will require the acquisition of the reservoir site and of rights of way, together with the construction of a pipe line several miles in length. Studies are being made to determine the flow of the stream for a basis of estimates of cost for the works necessary to utilize this apparent source.

When Fern Lake, above mentioned, was created, the dam which is earthfill with a clay and gravel puddle core, was designed so as to be enlarged. It was constructed to hold 15 feet in depth of water, and later was raised five feet. During the current biennium the dam was again raised five feet making the available depth 25 feet and the storage capacity about 114 acre-feet of water. The reservoir has a very small drainage tributary to it, and water to be stored must be brought from ravines north and south of it. It is not expected that these small streams will afford the lake's full capacity every year, but will do so most years.

The pump above mentioned as being used to pump water from Sonoma Creek into the Fern Lake Irrigation System was removed, and a 4-stage, 3-inch centrifugal pump driven by an electric motor was installed in its stead and which it is hoped will give much more effective service. Even with these adidtions to the water service, the supply is no more than sufficient to meet the present actual needs of the Home. It is imperative that other supplies be provided in the near future, and if plans now under consideration for the material enlargement of the institution be likely to materialize immediate steps should be taken to acquire a water supply to meet its demands.

A minor improvement effected in the last year was the repair of the leaky concrete distributing tank above mentioned. This does not add to the water supply but improves the means of distribution.

Preston School of Industry.

Water Supply. This institution located at Ione, Amador County, like nearly all other state institutions, finds its water supply inadequate to meet its constantly increasing needs.

The main supply is derived from an old water right, originally pertaining to mines, which was acquired when the school was first established. The water is diverted from Sutter Creek and conveyed in an old miners' ditch several miles to an artificial reservoir made by an earthen dam in a ravine. The water is heavily loaded with pulverized rock from the tailings of several quartz mills. The principal office of this reservoir is that of a settling basin in which a large part of the silt is deposited. Whatever storage capacity the reservoir originally had is largely reduced by the deposit named.

From the settling basin the water is conveyed in an open ditch to a small reservoir in the head of a ravine about a mile from the school and several hundred feet higher in elevation. The dam here is also of earth. The reservoir is small, its principal function being to regulate the flow of water which is conveyed in a riveted iron pipe to the school where it is distributed for use, part being used for irrigation of the grounds, and for fire protection, while a portion operates an electric power plant.

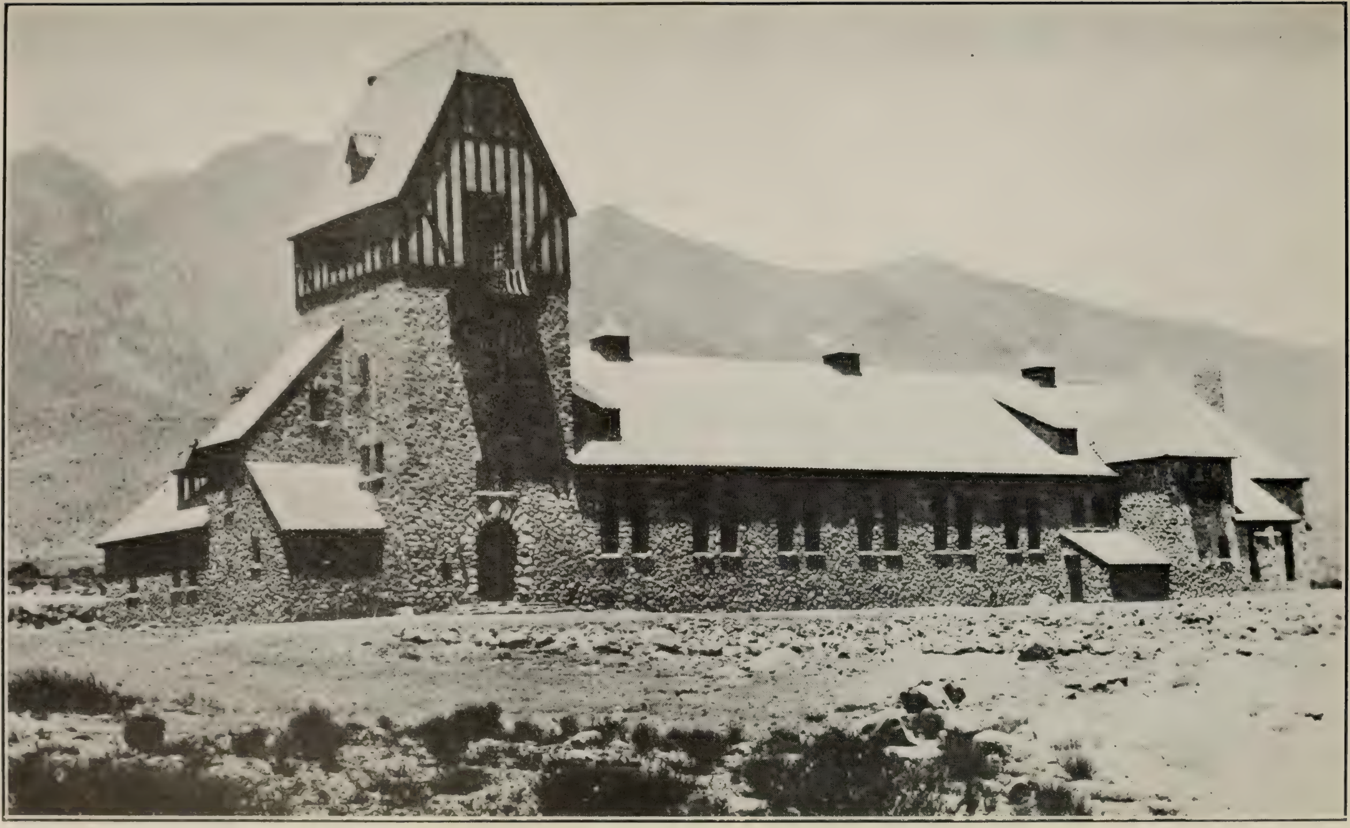
A few years ago the school management secured a small quantity of water from a ditch which supplies the town of Ione. This water is conveyed some six miles in a 4-inch screwed pipe and delivers the water into a tank in the tower of the administration building. When the pipe was laid, the funds were not sufficient to properly equip it with blow-off valves, and as the water carries considerable fine silt, the latter accumulated in the depressions, greatly reducing the capacity of the pipe.

During the past season the Department of Engineering was called upon to investigate the feasibility of increasing the school's water supply. It was found that the old ditch from the settling basin is in need of repairs. Several wooden flumes along the line are badly decayed and leaky, thus losing a considerable part of the water.

It is recommended that the ditch be repaired and the dam of the settling reservoir be raised six feet. Surveys have been made and plans and estimates will soon be submitted.

The domestic supply pipe has been fitted with blow-off valves, and the silt blown out, materially increasing the supply from that source. It is expected that when the suggested improvements are made in the ditch and reservoir the situation will be greatly relieved.

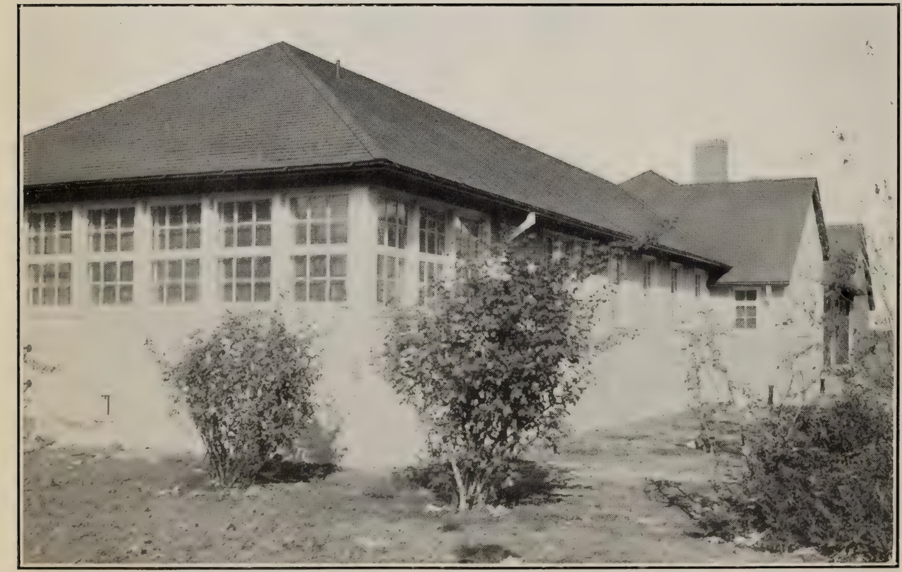
PLATE III.



Mount Whitney Fish Hatchery, Independence.

PLATE IV.

Patients' Cottage, Stockton State Hospital.



Tubercular Patients' Cottage, Agnew State Hospital.

State Fair Grounds.

Extension of Water System. The water pipes throughout the infield were rearranged and a system of sprinkling hydrants installed to irrigate the alfalfa with which the infield is planted.

Extension of Sewer System. Prior to the issuance of the last report the sewer system had been rearranged and connected with the city's sewers. Last summer some new connections were necessary to be made for the new exposition building, as well as the temporary structures erected for the State Fair, held in August of this year.

Whittier State School.

Water Supply. The water for this institution is obtained from the Whittier Water Company for domestic and fire uses, and from the Rincon Ditch Company for irrigation.

A controversy arose between the school and certain farmers along the ditch above where the state tapped it, as to the use of the water. The department succeeded in making an amicable arrangement between the parties which it is believed will obviate any further friction.

Marshall's Monument.

Water Supply. The erection of a new lodge for the custodian by the department necessitated improvement of the water supply. This was effected by laying about 3200 feet of 1½-inch pipe from some springs at a higher elevation than the house. A steel tank on a wooden tower 60 feet high was built, to which the water is conveyed and thence distributed to the lodge and throughout the grounds.

Sewers. A sewer was laid from the lodge, carrying the wastes to a point clear of the grounds.

San Quentin State Prison.

Water Supply. The water for domestic use at this institution is purchased from the water company. The quantity available from this source and the price paid for it, amounting to $1,500 a month, precludes its use for either fire protection or irrigation.

For fire purposes sea water is pumped into a tank on a hill above the buildings, while a small quantity for irrigating garden truck is obtained from wells.

A larger supply for both domestic and irrigation is greatly needed, and last year attempts were made to develop from wells, but without success.

Following this failure the department made investigations of the possibility of obtaining a supply adequate for the needs of the institution.

A reconnaissance discovered a reservoir site where a dam of moderate dimensions will store an abundance of water for all purposes of the prison. A pipe line about 7 miles in length would be required.

Sewerage at State Institutions. Several of the institutions have sewage disposal works of more or less elaborate design. The prevailing type is the hydrolitic tank with the effluent disposed of in irrigation, or discharged into nearby streams. This method is generally satisfactory and where complaints have arisen, it has been due to neglect in controlling the inflow so as to give it the correct time for hydrolitic action or in not cleaning out the sludge at proper intervals.

These conditions are brought about largely by reason of the inability of those in charge to understand the technic of the processes employed in reducing sewage wastes to an inoffensive state.

It is hoped that sometime a system of frequent inspections may be employed whereby the plants can be kept in efficient operation.

REPORT OF THE BUREAU OF ARCHITECTURE COVERING OPERATIONS FROM NOVEMBER 1, 1916, TO OCTOBER 1, 1918.

The Bureau of Architecture of the Department of Engineering has charge of all work of the Department of Engineering at forty-eight different state institutions and enterprises.

During the biennial period just ended, 114 different pieces of work have been completed; 50 additional pieces of work are now under construction and 16 more are being delayed on account of war conditions. Practically nothing has been done in connection with five of these 16, and these five, for which $1,050,000 is available, will be entirely omitted from the figures given in this report, which, therefore, will deal with a total of 175 different projects.

Of the 164 projects, construction of which is either completed or under way, 43 were contracted for and 121 are being constructed by day's labor. In the case of day's labor work, the bureau acts as contractor as well as architect, thus increasing office and inspection costs, but decreasing ultimate total cost of the project by eliminating contractor's profit. In connection with the remaining eleven of the total of 175 projects, office work has been completed, ready for actual construction to start.

Of the 175 projects, each one of ten covers innumerable small jobs which are classed under the head of ''Repairs and Improvements'' at ten of the larger institutions; 124 are projects of a value less than $10,000 each; 22 are projects of a value between $10,000 and $20,000 each; 15 are projects of a value between $20,000 and $50,000 each; and four are projects of a value in excess of $50,000 each.

These figures indicate that more than 75 per cent of the projects handled were of a value less than $10,000 each and most of these very much less than $10,000 each. This condition has made the architectural work involved much more expensive than it would have been otherwise.

The total expenditure for these 175 different pieces of work is $2,072,460. The office work in the bureau in connection with these 175 projects is costing $132,550, or 6½ per cent of their value. The cost of inspection is the expense involved in maintaining an inspector on the work during the entire time of construction and is the same as in private practice.

The 6½ per cent cost for office work mentioned above covers both contract and day's labor work. In private practice, 6 per cent is paid for architectural service in connection with contract work costing more than $10,000 and 10 per cent if the cost is below $10,000; 10 per cent additional is paid when the day's labor method is used; therefore, in connection with the 175 projects, under consideration in this report, the architectural service in private practice would have cost $217,000, or 10½ per cent of the total value of the work, instead of the $132,550 or 6½ per cent which it has cost in the bureau.

In addition to the work involved in the 175 projects above mentioned, a large amount of sketching has been done and consultation conducted covering projects not yet actually undertaken; this sketching and consulting will always be necessary as a basis for deciding upon future work. Our statutory men also spend a large amount of time giving required advice and counsel regarding technical matters to the various institution managements and state boards and departments.

In addition to the above, the bureau during the last two years has conducted two competitions for the selection of architects outside the bureau. The first was in connection with the San Francisco State Building which is to be constructed on the Civic Center in San Francisco, and the second for the Library and Courts Building and the Office Building which are to be constructed at Sacramento. Both of these competitions were entirely successful. Following the competition for the San Francisco State Building, the architects, Bliss and Faville of San Francisco, have completed the working drawings and specifications, and the bureau had done the mechanical and structural work covering working drawings and specifications, for the building, in accordance with the terms of the contract between the department and Bliss and Faville. The cost of this work by the bureau is included in the above total of $132,550, although this project is not included in the 175 herein reported upon. The taking of bids and construction of this building are being delayed until conditions return to normal, so as to make it possible to construct the building within the money available.

Messrs. Weeks and Day, architects of San Francisco, have been selected in connection with the Sacramento buildings, and work is being delayed until conditions become normal.

The reproductions of photographs which accompany this report have been selected as being typical of nearly all of the various kinds of buildings which the bureau is constructing for the state.

Following is a report as of date October 1, 1918, giving a summary showing progress made fourteen months after the appropriations became available:

REPORT INDICATING STATUS OF WORK HANDLED BY THE ARCHITECTURAL BUREAU OF THE STATE DEPARTMENT OF ENGINEERING SINCE THE LEGISLATURE OF 1917.

October 1, 1918.

Summary Showing Progress Fourteen Months After Appropriations Became Available.

1. Number of items entirely or practically completed	94
2. Number of items on which office work is completed and construction under way	41
3. Number of items on which office work is completed but construction not yet started	5
4. Number of items on which preliminary work is completed and working drawings under way	1
5. Number of items on which preliminary work is completed and working drawings not yet started	3
6. Number of items on which preliminary work is under way	3
*7. Number of items on which nothing has been done	6
8. Number of items which have been abandoned	10

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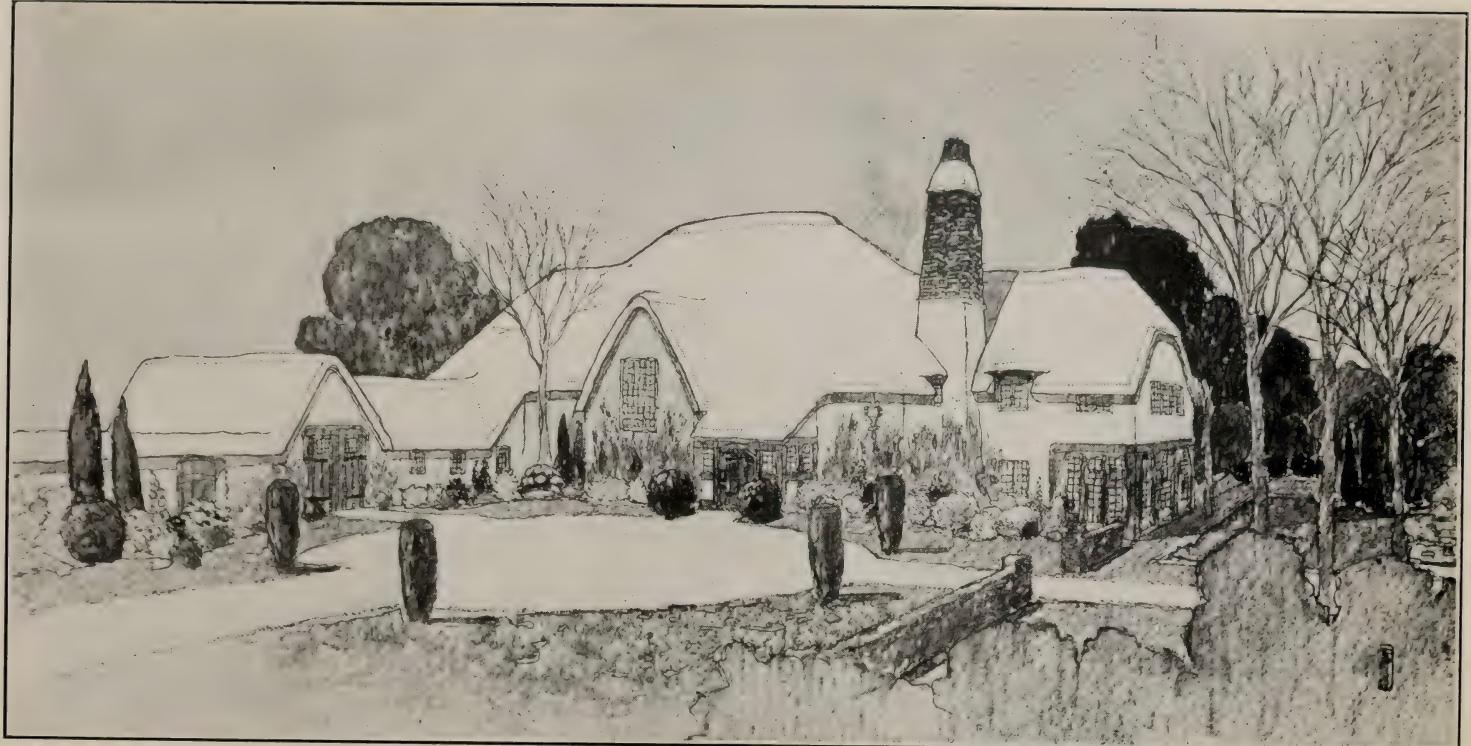
*Six of these are being delayed by circumstances over which this department has no control.

Water tower; Service Building, Whittier State School.

PLATE VI.



Superintendent's Residence, Whittier State School.

REPORT INDICATING STATUS OF WORK HANDLED BY THE ARCHITECTURAL BUREAU OF THE STATE DEPARTMENT OF ENGINEERING SINCE THE LEGISLATURE OF 1917.

October 1, 1918.

Fund	Name	Appropriation	Cost of this work	Remarks
	Agnews State Hospital.			
Chap. 332, 1917	Workers' cottage for men	$45,000 00	$45,000 00	Office work complete. Under construction by contract; about 40 per cent complete.
Chap. 307, 1917	Cottage for female patients	30,000 00	28,000 00	Practically complete.
Cont. est.	Pumping plant for irrigation	1,800 00	1,800 00	Complete.
	Agricultural Park, Sacramento.			
Chap. 775, 1917	Agricultural pavilion	300,000 00	300,000 00	Office work complete. Under construction by subcontracts; about 60 per cent complete.
Chap. 281, 1917	Miscellaneous repairs to sheds, barns, etc., for 1917 and 1918 fair	8,500 00	8,500 00	Completed.
Chap. 280, 1917	Miscellaneous repairs to sheds, barns, etc., for 1917 and 1918 fair	5,000 00	5,000 00	Completed.
Chap. 358, 1917	Repairs to roof, manufacturers' pavilion		1,000 00	Completed.
	California School for the Deaf and the Blind, Berkeley.			
Chap. 348, 1917	Repairing greenhouse	20,000 00	500 00	Completed.
Chap. 348, 1917	New foundations, etc., for horse barn	20,000 00	800 00	Completed.
Chap. 348, 1917	Moving horse barn	20,000 00	1,000 00	Completed.
Chap. 348, 1917	Heating in greenhouse	20,000 00	800 00	Completed.
Chap. 348, 1917	Alterations to second floor of laundry	20,000 00	1,200 00	Completed.
Chap. 348, 1917	Laundry repairs	20,000 00	300 00	Completed.
Chap. 348, 1917	Grading for cow corral	20,000 00	5,000 00	Completed.
Chap. 348, 1917	Garage for superintendent's residence	20,000 00	300 00	Completed.
Chap. 348, 1917	Miscellaneous repairs and improvements	20,000 00	10,100 00	Completed.
Chap. 293, 1917	Completion of heating plant	21,000 00	21,000 00	Completed.
Chap. 294, 1917	Completion of electric wiring	5,000 00	5,000 00	Completed.
	California Polytechnic School, San Luis Obispo.			
Chap. 471, 1917	Repairing the buildings	5,000 00	5,000 00	Completed.
Chap. 315, 1917	Barn	4,000 00	4,000 00	Abandoned during war.

REPORT INDICATING STATUS OF WORK HANDLED BY THE ARCHITECTURAL BUREAU OF THE STATE DEPARTMENT OF ENGINEERING SINCE THE LEGISLATURE OF 1917—Continued.

October 1, 1918.

Fund	Name	Appropriation	Cost of this work	Remarks
	California School for Girls, Ventura.			
Chap. 367, 1917	Two cottages	$63,000 00	$53,000 00	Office work complete. Contract just being executed. Construction will start at once.
Chap. 362, 1917	Trades building and gymnasium	30,000 00	30,000 00	Office work complete. Contract just being executed. Construction will start at once.
Chap. 364, 1917	Service connections to new buildings	6,000 00	6,000 00	Preliminary data now being secured.
Chap. 474, 1917	Water system	10,000 00	10,000 00	Preliminary data now being secured.
Chap. 366, 1917	Improvements of grounds	4,000 00	4,000 00	Being attended to by institution as needed.
Chap. 361, 1917	Ice plant in commissary	2,000 00	2,000 00	Completed.
Chap. 365, 1917	Heating of office in commissary building and manor house	1,200 00	1,200 00	Completed.
	Chico State Normal School.			
Chap. 282, 1917	Addition to training school building	16,000 00	15,500 00	Completed.
	Exposition Park, Los Angeles.			
City	Horse barns for Liberty Fair	------------	6,000 00	Practically completed.
Expo. Park	Increasing heating plant, Exposition Building	2,800 00	2,800 00	Completed.
Expo. Park	Interior alterations, Exposition Building	17,000 00	17,000 00	Completed.
Expo. Park	Elevator repairs	300 00	300 00	Completed.
	Folsom State Prison.			
Chap. 278, 1917	Repairs and improvements	25,000 00	25,000 00	Being done at institution as needed.
Chap. 276, 1917	Prison school building	10,000 00	10,000 00	Office work complete. Being built by institution labor. About 20 per cent complete.
Chap. 254, 1917	Sewage disposal system	11,000 00	11,000 00	Completed.
Chap. 573, 1909	Cottage for employees	1,300 00	1,300 00	Completed.
Chap. 279, 1917	Construction of new cottages for employees	12,500 00	10,000 00	Practically completed.
Chap. 279, 1917	Repairs to existing cottages for employees	12,500 00	2,500 00	Completed.
Chap. 485, 1917	Purchase of boilers and additional installation to power plant	15,000 00	13,500 00	Office work complete. Boiler and other equipment on hand. Installation will begin when building is ready.
Chap. 485, 1917	Power house building	15,000 00	1,500 00	Office work complete. Under construction by institution labor. About 25 per cent complete.
	Fresno State Normal School.			
Chap. 240, 1917	Swimming pool and balconies in gymnasium	17,000 00	8,000 00	Completed.
Chap. 240, 1917	Electrical equipment	17,000 00	3,000 00	Office work complete. Materials now under order.
Chap. 240, 1917	Alterations to cafeteria and caretakers' cottage	17,000 00	3,500 00	Completed.

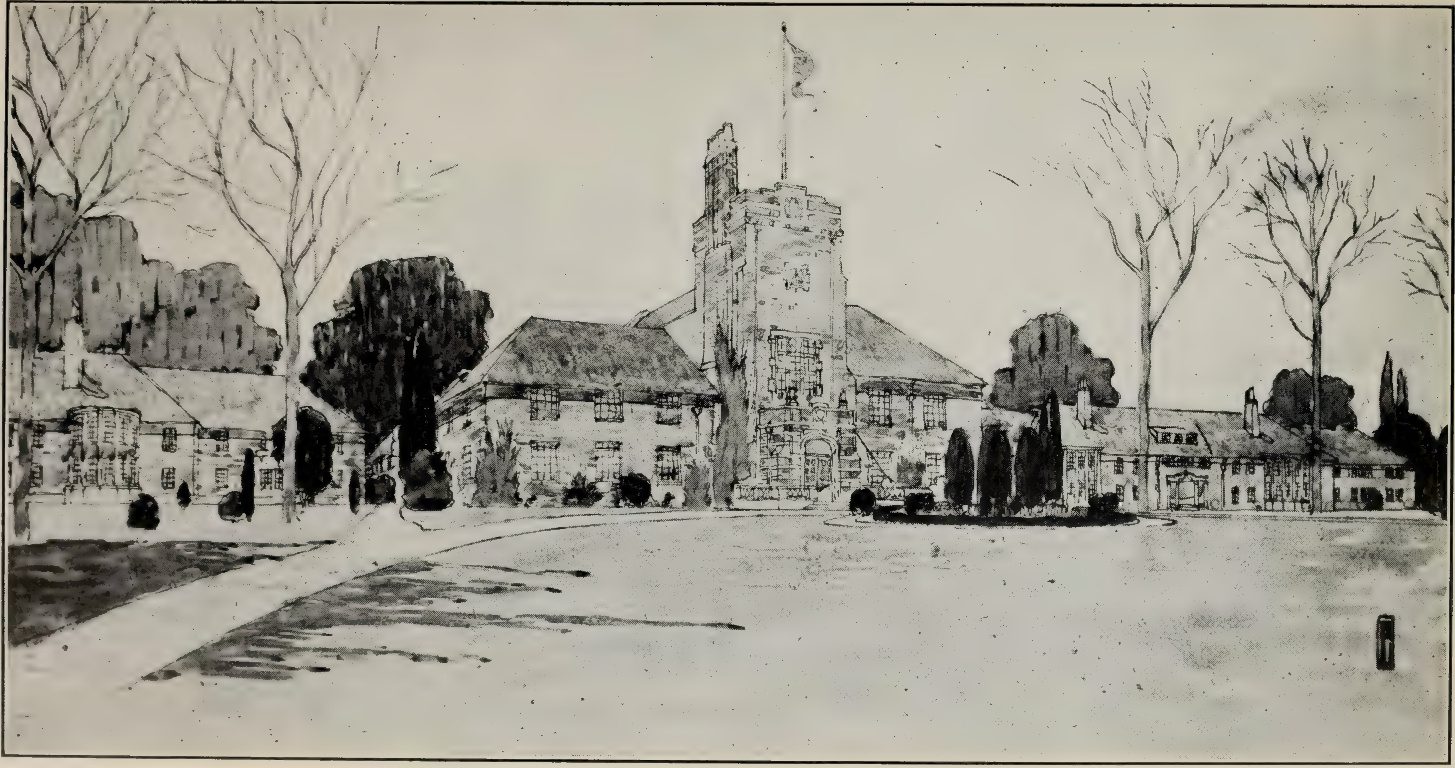
	Humboldt State Normal School.			
Chap. 237, 1917	Painting temporary buildings	1,000 00	1,000 00	Completed.
Chap. 743, 1917	Grading of site	230,000 00	3,500 00	Completed.
Chap. 743, 1917	Main buildings	230,000 00	220,000 00	Abandoned during war. Office work completed.
Chap. 743, 1917	Main sewer	230,000 00	2,000 00	Completed.
Chap. 743, 1917	Moving temporary buildings	230,000 00	1,000 00	Completed.
	Industrial Home for the Adult Blind.			
Chap. 292, 1917	Alterations and additions to buildings	8,700 00	7,000 00	Completed.
Chap. 292, 1917	Miscellaneous repairs	8,700 00	1,700 00	Completed.
Chap. 288, 1917	Improvements for grounds	960 00	960 00	Completed.
Chap. 289, 1917	Digging shaft and tunnels for water supply	4,250 00	2,000 00	Completed.
Chap. 289, 1917	Pumping equipment	4,250 00	500 00	Completed.
	Los Angeles State Normal School.			
Chap. 335, 1917	New garage and additions to Manual Arts Building and Library Cloister	14,800 00	10,000 00	Completed.
Chap. 334, 1917	Repairs to artificial stone	3,000 00	800 00	Completed.
Chap. 334, 1917	Treatment of art stone	3,000 00	1,500 00	Practically complete.
Chap. 334, 1917	Changes in heating system	3,000 00	600 00	Completed.
Chap. 335, 1917	Fire escapes to balcony of auditorium	14,800 00	1,400 00	Office work complete. Contract just let.
Emergency	Barracks for student soldiers	15,000 00	14,000 00	This job initiated September 6, 1918. Practically complete.
	Mendocino State Hospital.			
Chap. 296, 1917	New laundry and bakery	28,000 00	15,000 00	Completed.
Chap. 296, 1917	Oven for bakery	28,000 00	3,000 00	Completed.
Chap. 327, 1917	New patients' cottage	28,000 00	20,000 00	Office work complete. Under construction by day labor. About 90 per cent complete.
Chap. 370, 1917	New boilers	18,000 00	18,000 00	Part of equipment on hand and being installed by day labor. About 20 per cent complete.
Chap. 267, 1917	Water softening plant	7,500 00	7,500 00	Office work complete. Work of installation being done by day labor. About 65 per cent complete.
Chap. 268, 1917	Reconstruction of ward 7	5,000 00	5,000 00	Office work complete. Under construction by day labor. About 50 per cent complete.
Chap. 325, 1917	Repairs to plumbing	5,000 00	5,000 00	Being done at institution as needed.
Chap. 371, 1917	Repairing structural defects in administration building	3,500 00	3,500 00	Completed.
Chap. 328, 1917	Enlarging operating room	3,000 00	3,000 00	Abandoned.
Chap. 269, 1917	Repairs to flooring	2,500 00	2,500 00	Completed.
Cont. est. 1058	Rewiring	11,500 00	11,500 00	Completed.
Cont. est. 1058	Ground lighting	2,500 00	2,500 00	Office work complete. Abandoned because of war conditions.
Cont. est.	Auxiliary water supply	6,900 00	6,900 00	Completed.

REPORT INDICATING STATUS OF WORK HANDLED BY THE ARCHITECTURAL BUREAU OF THE STATE DEPARTMENT OF ENGINEERING SINCE THE LEGISLATURE OF 1917—Continued.

October 1, 1918.

Fund	Name	Appropriation	Cost of this work	Remarks
	Napa State Hospital.			
Chap. 242, 1917	Pathological laboratory	$20,000 00	$20,000 00	Abandoned during war. Office work completed.
Chap. 480, 1917	Two cottages	58,000 00	52,000 00	Office work complete. Under construction by contract. About 10 per cent complete.
Chap. 241, 1917	Cottage for convalescent females	15,000 00	15,000 00	
Cont. est.	Repairs to gas plant	1,200 00	1,200 00	Completed.
Chap. 398, 1917	Electric elevators	10,000 00	10,000 00	Completed.
Chap. 399, 1917	Sewer line	10,000 00	10,000 00	Completed.
Chap. 397, 1917	Repairs to boiler house equipment	6,000 00	4,500 00	Completed.
Chap. 397, 1917	Repairs to boiler house	6,000 00	1,500 00	Preliminary data obtained.
	Norwalk State Hospital.			
Chap. 346, 1917	Workers' cottage for females and two receiving cottages	135,000 00	130,000 00	Office work complete. Under construction by contract; about 75 per cent complete.
Chap. 346, 1917	Service connections for cottages	135,000 00	5,000 00	Office work complete. Under construction by day labor; about 80 per cent complete.
Chap. 345, 1917	Administration building	50,000 00	46,000 00	Abandoned during war.
Chap. 344, 1917	Farm buildings	36,700 00	36,700 00	Question of construction during war not yet determined by Board of Control.
Chap. 343, 1917	Superintendent's cottage	10,000 00	9,000 00	Office work complete. Under construction by day labor; about 50 per cent complete.
Cont. est.	Pumping plant for irrigation service	5,300 00	5,300 00	Completed.
Chap. 345, 1917	Service connections for administration building	5,000 00	4,000 00	Completed.
	Preston School of Industry.			
Chap. 301, 1915	Power plant and water system	30,000 00	12,000 00	Completed.
Chap. 172, 1913	Cottages 4 and 5	23,000 00	12,000 00	Cottage No. 4 complete; cottage No. 5, 50 per cent complete.
Chap. 411, 1917	Repairs and improvements to buildings	10,000 00	10,000 00	Being attended to at institution as needed.
Chap. 529, 1913	Conversion of band cottage into hospital	12,000 00	6,000 00	This project initiated in July, 1918. Office work complete and materials now being ordered.
	San Diego State Normal School.			
Chap. 246, 1917	Paving around buildings	5,500 00	2,000 00	Completed.
Chap. 333, 1917	Miscellaneous repairs to buildings	7,000 00	3,000 00	Completed.
Chap. 333, 1917	Miscellaneous electric work	7,000 00	1,800 00	Completed.
Chap. 333, 1917	Time-clock system	7,000 00	2,200 00	Completed.
Chap. 246, 1917	Miscellaneous painting around grounds	5,500 00	500 00	Completed.
Chap. 308, 1917	Paving in front of school	1,500 00	1,500 00	Completed.

PLATE VII.



Administration Building, Norwalk State Hospital.

PLATE VIII.

Humboldt State Normal School, Arcata.

	San Francisco State Normal School.			
Inst. cont.	Repairs to buildings on account of fire	2,000 00	2,000 00	Completed.
Chap. 491, 1917	Purchase of site, construction of new buildings and improvement of grounds	775,000 00	775,000 00	Nothing being done; institution not ready.
	San Francisco State Office Building.			
Chap. 541, 1913	Office building for state offices	1,000,000 00	1,000,000 00	Office work complete. Abandoned during war.
	San Jose State Normal School.			
Chap. 258, 1917	Assembly hall	80,000 00	70,000 00	Office work complete. Abandoned during war.
	San Quentin State Prison.			
Chap. 233, 1917	Electrification and rewiring	32,500 00	32,500 00	Practically complete insofar as present funds will go.
Chap. 284, 1917	Administration building	20,000 00	10,000 00	Office work complete. Under construction by day labor. About 25 per cent complete.
Chap. 284, 1917	Recreation building	20,000 00	8,000 00	Office work complete. Under construction by day labor. About 80 per cent complete.
Chap. 253, 1917	Electrification and rewiring	3,500 00	3,500 00	Completed.
Chap. 285, 1917	New additions to farm building	5,000 00	5,000 00	Waiting for institution to furnish preliminary data.
	Santa Barbara State Normal School.			
Chap. 257, 1917	Gymnasium building	20,000 00	18,000 00	Completed.
Chap. 250, 1917	Sewer system	1,000 00	1,000 00	Completed.
	Sonoma State Home.			
Chap. 266, 1917	Laundry building	22,500 00	20,000 00	Office work complete. Under construction by contract. About 20 per cent complete.
Chap. 265, 1917	Bakery building	15,000 00	11,000 00	Office work complete. Under construction by contract. About 20 per cent complete.
Chap. 264, 1917	Cottage for low grade girls	15,000 00	15,000 00	Practically complete.
Chap. 351, 1917	Steam pipe extension	8,100 00	8,100 00	Completed.
Chap. 265, 1917	Ovens for bakery	15,000 00	2,600 00	Office work complete. Bids taken and contract awarded. Construction waiting on bakery building.
Chap. 353, 1917	Reconstruction and enlarging of Madroña Hall for commissary	5,000 00	5,000 00	No start can be made until laundry and bakery are completed and occupied.
Chap. 352, 1917	Reflooring	4,000 00	4,000 00	Completed.

REPORT INDICATING STATUS OF WORK HANDLED BY THE ARCHITECTURAL BUREAU OF THE STATE DEPARTMENT OF ENGINEERING SINCE THE LEGISLATURE OF 1917—Continued.

October 1, 1918.

Fund	Name	Appropriation	Cost of this work	Remarks
	Southern California State Hospital.			
Chap. 338, 1917	Cottage No. 17	$45,000 00	$41,000 00	Completed.
Chap. 404, 1917	Nurses' home	15,000 00	12,500 00	Practically completed.
Chap. 404, 1917	Industrial building	15,000 00	2,500 00	Completed.
Chap. 336, 1917	New boiler	8,000 00	8,000 00	Boiler delivered and set up. Department's work complete. Bricking up of boiler being done by institution.
Chap. 337, 1917	New wiring in old buildings and grounds	8,000 00	8,000 00	Under construction by day labor; about 85 per cent complete.
Chap. 339, 1917	Pump, motor connections, etc., to new well	3,000 00	3,000 00	Completed.
Chap. 338, 1917	Service connections to cottage 17	45,000 00	1,250 00	Completed.
Chap. 404, 1917	Service connections to nurses' home	15,000 00	1,000 00	Completed.
Cont. est.	Repairs to main buildings on account of earthquake damage	3.000 00	6,000 00	Practically completed.
	Stockton State Hospital.			
Chap. 330, 1917	Cottage for disturbed patients	45,000 00	45,000 00	Bids opened on September 30th—being considered.
Chap. 272, 1917	Tubercular hospital	10,000 00	10,000 00	Bids opened on September 30th—being considered.
Chap. 235, 1917	Alterations and additions to bakery and kitchens	15,000 00	8,000 00	Completed.
Chap. 235, 1917	Refrigerating plant for kitchen	15,000 00	1,000 00	Completed.
Chap. 234, 1917	Repairs and additions to mechanical equipment	8,000 00	8,000 00	Completed.
Cont. est.		6,515 00	6,515 00	Completed.
Chap. 792, 1917	Crematory	5,000 00	4,500 00	Building is completed and retort is now being built. About 15 per cent complete.
	Veterans' Home.			
Chap. 263, 1917	Repairs and improvements to buildings	15,000 00	15,000 00	Being attended to at institution as needed.
Chap. 483, 1917	Boilers	15,000 00	15,000 00	Nothing being done. No urgent need.
Chap. 243, 1917	Tubercular ward	10,000 00	10,000 00	Office work complete. Under construction by day labor. About 85 per cent complete.
Chap. 394, 1917	Quarters for inebriates	8,000 00	8,000 00	Office work complete. Under construction by day labor. About 20 per cent complete.
Chap. 395, 1917	Chapel	5,000 00	5,000 00	
Chap. 426, 1917	Enlargement of hospital kitchen	4,000 00	3,500 00	Practically complete.
Chap. 392, 1917	Plumbing and repairs to plumbing	2,500 00	2,500 00	Being attended to at institution as needed.
Chap. 244, 1917	Painting buildings	7,500 00	7,500 00	Nothing being done as yet.
Chap. 391, 1917	Completing electric wiring	2,500 00	2,500 00	Completed.
Chap. 213, 1915	Repairs to plastering hospital	15,000 00	3,500 00	Completed.
Chap. 263, 1917	Quarters for assistant physician	15,000 00	1,000 00	Completed.

	Whittier State School.			
Chap. 357, 1917	Steam distribution system	45,000 00	10,000 00	Office work complete. Installation being made by day labor. About 30 per cent complete.
Chap. 238, 1915	Cottage No. 12	60,000 00	15,000 00	Completed.
Chap. 356, 1917	Cottage No. 11	82,500 00	40,000 00	Office work complete. Under construction by day labor. About 90 per cent complete.
Chap. 356, 1917	New shop buildings and power house	82,500 00	------------	Office work complete. Construction just started.
Chap. 355, 1917		25,000 00	35,000 00	
Chap. 356, 1917	Laundry and tailor shop	82,500 00	15,000 00	Office work complete. Construction will not start until power house and shop buildings are complete.
Chap. 357, 1917		45,000 00	------------	
Chap. 355, 1917	Power house equipment	25,000 00	8,000 00	Office work complete. Construction will not start until power house and shop buildings are complete.
Chap. 356, 1917	Chicken and rabbit houses	82,500 00	3,000 00	Completed.
Chap. 356, 1917	Quarters for employees	82,500 00	3,500 00	Abandoned.
Chap. 356, 1917	Water tower	25,000 00	8,500 00	Working drawings now being made.
	New Institutions and Miscellaneous.			
Chap. 768, 1917	State Printing Office	100,000 00	100,000 00	Nothing being done. No site selected.
Chap. 776, 1917	Pacific Colony (home for feeble minded)	250,000 00	250,000 00	Considerable preliminary office work has been done. Real progress delayed pending selection of site.
------------	State Capitol Extension buildings	3,000,000 00	3,000,000 00	Competition completed and architect selected. Further progress stopped because of war.
Chap. 321, 1917	Restoring old custom house, city of Monterey	5,500 00	5,500 00	Completed.
Chap. 322, 1917	Restoring old theater, city of Monterey	3,500 00	3,500 00	Completed.
Chap. 368, 1917	Painting exterior of Capitol	5,000 00	2,500 00	Completed.
Chap. 248, 1917	Repairs and improvements, Women's Relief Corps Home Ass'n	5,000 00	5,000 00	Completed.
Chap. 430, 1917	Equipment of vault, office of Secretary of State	4,000 00	4,000 00	Completed.
Chap. 400, 1917	Improvement of grounds at Marshall's Monument, El Dorado Co.	4,000 00	4,000 00	Completed.
Chap. 311, 1917	Restoration of Fort Ross, Sonoma	1,500 00	1,500 00	Part of work completed. Balance of work under way.
Chap. 376, 1917	Electric lighting at Sutter's Fort, Sacramento	1,000 00	1,000 00	Completed.
Chap. 759, 1917	Office building for State Mining Bureau at Coalinga	4,000 00	4,000 00	Completed.
Chap. 759, 1917	Office building for State Mining Bureau at Taft	4,250 00	4,250 00	Completed.
Bd. of Control Emergency	Miscellaneous repairs to Governor's mansion on account of explosion	------------	1,500 00	Completed.
Bd. of Control Emergency	New heating system, Governor's mansion	------------	1,000 00	Completed.
Fish and Game Preservation	Fish hatchery, Yosemite Valley	------------	------------	Office work complete. Abandoned during war.

PART II.

HYDROECONOMICS.

Every body of water has its uses, and often one body may have several uses, all contributing to the welfare of man. Broad arms of the sea, stretching inland, offer easy highways for cheap communication and transportation for the communities along their shores. Broad rivers afford like facilities for commerce, and also furnish water for irrigation of the lands along their banks to produce that commerce. Tributary streams contribute power for lighting the streets and homes of communities created by the benign influences of the others, as well as operating the myriad wheels of industry. And all unite, in the mad moods of nature, to send destruction and ruin upon the works of their beneficence.

Each body or stream has problems of its own to be solved that its forces may be directed to beneficial use, some akin and some dissimilar in the methods of their solution.

SACRAMENTO RIVER PROBLEMS.

That in the Sacramento Valley lie a million acres of land periodically laid waste by the flood waters of the Sacramento River is too well known to need extended mention here. That concrete effort is being made to rescue that vast body of land from waste and convert it into an asset to the state is also known and the methods by which reclamation is to be effected have been so fully set forth in previous reports of this department that no details of the plans need to be extended at this time.

Suffice it to say that the plans for the ultimate protection of the lands subject to overflow in the Sacramento Valley and the adjacent deltas of Mokelumne and San Joaquin rivers were formulated by government engineers acting under the directions of the Caminetti Act, passed in 1893.

After forty-four years of agitation and of abortive effort at individual unit reclamation, the United States Debris Commission was created to regulate hydraulic mining so that no further mining debris should reach the navigable rivers, and to formulate plans for the improvement of the streams.

At the end of seventeen years devoted to surveys, research and studies, the commission reported a plan for the improvement of navigation, control of floods and reclamation of lands.

The report, which was presented in 1911, and published as House Document No. 81, Sixty-second Congress, first session, recommended that the cost of the work be borne jointly by the United States, the state of California and the landowners who would be direct beneficiaries of complete reclamation and protection.

By an act of the California legislature, approved December 24, 1911,[1] the report of the Debris Commission was approved with such modifications and amendments as might be found advisable, and there was created a body known as the State Reclamation Board, to administer the matter in behalf of the state. The plan submitted is, in brief, as follows:

> (*a*) To construct strong levees on each bank of the river so as to make the channel carry as much water as possible with safety.
>
> (*b*) To construct weirs at selected points through which to discharge excess waters under control.
>
> (*c*) To construct artificial channels through the basins of ample size to convey the excess waters turned into them through the weirs. These by-passes to return their waters to the main river about 15 miles above the mouth of the latter at Suisun Bay.
>
> (*d*) To enlarge the lower 15 miles of the river channel so it will safely carry the united waters of the river and the by-passes.

The total cost of the project as proposed was estimated at $33,800,000.

A preliminary report had been submitted in 1907, showing the need of enlarging the mouth of the Sacramento River as a first step in any comprehensive scheme and estimating the initial cost to be $800,000, recommending an equal division of expense between the United States and the state. The legislature promptly accepted the recommendation and appropriated funds to cover the state's share.

The law creating the Reclamation Board provided that no levees should be constructed by private parties unless they conformed to the plan and were approved by the board.

The adoption of a settled policy for flood control and reclamation stimulated individual effort to such a degree that much of the public work proposed by the plan was effected by private enterprise, and a recasting of estimates by the Debris Commission, submitted early in 1913, showed a reduction in the probable cost to the governments from $22,000,000 to $11,200,000,[2] as the joint cost to the public.

This last estimate did not include the $800,000 already provided by the Congress and legislature for channel enlargement. The commission recommended that one-half of the estimated cost be paid by the United States and the other half by the state. This proposition was formally approved by the adoption by Congress of the Flood Control Act of March 1, 1917, and by the state legislature, as above set forth.

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[1] Chapter 25, Statutes, extra session, 1911.

[2] River and Harbor Com. Doc. No. 5, 63d Cong. 1st Sess.

Two large suction dredges, the *Sacramento* and *San Joaquin*, were built and began the task of enlarging the mouth of the Sacramento in the summer of 1913. That work has steadily progressed ever since excepting for a short time during the last year, when the dredges were temporarily withdrawn and employed in dredging to expedite war work at Oakland and Mare Island, upon completion of which they were returned to the river work.

The original estimate of earth to be moved in enlarging the channel below Cache Slough, as published in the report[3] was 148½ million cubic yards, of which four million and eighty-three thousand cubic yards would be used in levees. It has been quite a problem to find dumping ground for this vast volume of material, which, if spread evenly over the ground, would cover 3000 acres about 30 feet deep. Much of the land which is required for the purpose is extremely fertile peat soil, and to cover it 30 feet deep, or any depth, for that matter, with dredgings, means destruction of its productiveness for several years. Fortunately, though, a very large portion of the spoil can be disposed of by filling the old channels, like the one around Horseshoe Bend, and others outside the lines of improvement and which will be abandoned as water-carriers when the enlarged cut is completed. Also along the west side of the river a system of hills rises which has many undulations, extending back from the water's edge, which can be utilized for filling up to the 35-foot contour.

The state has acquired title to, or easements upon, nearly all of the lands to be required for the purposes of this part of the project.

In acquiring easements for the deposit of dredged material on lands in Sherman Island, the state agreed to protect adjoining lands from injury. A drainage ditch serving a large body contiguous to a spoil field became partly filled from mud escaping into it, and the Department of Engineering had it cleaned, at a cost of $2410.

The state has also expended $12,400 in constructing a levee to hold back spoil deposits.

The prosecution of work on the "upper project," that is, the construction of levees forming by-passes by private interests, and of structures accessory thereto, has been going on, though on a much reduced scale, owing to restrictions imposed by war conditions.

One of the most notable achievements in this field has been the completion of the Bryte Weir, which is intended to divert surplus waters from Sacramento River into the Yolo By-pass about four miles above the city of Sacramento.

In view of the fact that the river below the confluence of Feather River is calculated to carry 50,000 second-feet of water, to which the

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[3] H. Doc. 81, 62d Cong. 1st Sess.

American River entering above the city may contribute 125,000 second-feet, and that the capacity of the improved channel at and below the city is only a little more than 100,000 second-feet, the completion of the weir and its successful operation was a consummation imperatively necessary for the welfare of the Capital City, should floods recur such as have been experienced within the recent past.

Anticipating that a full report will be published by the Reclamation Board, under whose direction the work is being conducted, further discussion of the subject is left to that document.

HYDROGRAPHIC WORK.

All matters of drainage, improving and rectifying river channels and other work on any river or slough connecting with San Francisco Bay, San Pablo Bay, and Suisun Bay, and the tide waters flowing in said bays, or streams elsewhere in the state, wherein state moneys are expended, are placed under the management of the Department of Engineering. The duties so prescribed by law include improving the navigability of such waters, acquiring rights of way for improvements; purchase, construction and operation of dredges and other equipment required for such work; making surveys, investigations and reports upon the feasibility of canalizing the rivers and constructing navigable canals; surveys, investigations and plans for flood control upon any stream, the flood waters of which may injure or menace lands in California, including the examination and supervision of dams, and investigation of rainfall, snowfall and run-off affecting or tending to affect navigation or flood control upon any of the streams of the state.

Owing to the loss of personnel, the scarcity and abnormally high price of material and other limitations due to war conditions, the activities of the department in these matters for the last two years has been confined to a rigidly enforced minimum.

River Work.

Owing to the fact that the climate of the Great Valley is passing through a ''dry'' cycle, no great floods have occurred in either stream system for several years. Not since 1911 has the San Joaquin experienced a flood, and 1909 was the last high water in the Sacramento which reached dangerous conditions.

As a consequence of several years immunity from floods, there have been no crevasses formed requiring closures or extensive protection works.

Long-continued low plane of the water surface, however, is conducive to active caving of the alluvial banks, and in places this has occurred to the great loss of good land and destruction of levees, creating conditions where serious breaches would likely occur at the next flood. The department has kept close watch of such conditions, and wherever danger threatened has applied remedial measures.

The principal work of the river improvement division since the last report has been to repair and maintain revetment previously laid and to place new revetment where conditions demanded.

Wherever the placing of protective works will inure to the direct benefit of adjacent lands because of increased security against flood damage, the owners are required to contribute a portion of the cost, in proportion to the benefits so received.

The work executed by the river division during the two years past has consisted principally of completing work that was in progress at the time of the last report; of repairing and extending work previously executed. Only one extensive and one or two minor jobs of new work were undertaken. The work is summarized as follows:

San Joaquin River.		
Lorenzen Bend, repairs and extensions		$2,287 78
Paradise Bend, repairs and extensions		1,431 40
New Banta Reclamation District, repairs and extensions		1,979 24
Reclamation District No. 17, repairs and extensions	$1,080 17	
Reclamation District No. 17, new mattress	2,286 97	
		3,367 14
Reclamation District No. 544, repairs and extensions		1,525 76
Sacramento River.		
Three-mile Slough, pile bulkhead, repairs		786 03
Edinger Farm, near Hood, new pile bulkheads		3,959 06
(State, Sacramento County and Mr. Edinger, each one-third.)		
Meridian, brush mat, repairs and extension		307 81
Mad River.		
Brush bulkheads, repairs and extensions		1,937 29

NOTE.—In all of above work, excepting at Edinger Farm, adjoining property owners contributed one-half of the cost.

Mokelumne River.

Terminus Landing. The levees protecting Reclamation District No. 548 along South Fork of Mokelumne River and Potato Slough are exposed to severe action from a long fetch up the river as well as across submerged Bouldin Island. They were becoming badly disintegrated and in danger of destruction from floods of the river.

A breach would cause flood waters to carry sand into the channels of Potato and Connection sloughs to the injury of navigation thereon, both of which streams are important highways for the transportation of produce from adjacent territory to market.

A new type of revetment was introduced here, consisting of sheet concrete covering the slope of the embankment and rising in a parapet at the top, and protected at the bottom by a vertical toe wall, 12 inches deep. The parapet rises vertically 19 inches with a curved face toward the water. It serves admirably to turn back the waves running up the slope and prevents any water being driven over the levee.

The length of this work was 3,310 feet, width on 2 to 1 slope, including toe wall and parapet is 18 feet 10 inches and thickness 3 inches. Triangle wire mesh reinforcement was used throughout. Expansion joints were placed every 20 feet. The cost of the work, including grading the slope, was $4.1357 per lineal foot, or $0.2196 per square foot in place, or a total cost of $13,689.41, which was borne equally by the state and district.

Flow measurements.

Since this department is charged with the duty of caring for navigation interests on the streams and also is required to foster irrigation enterprises, it is conceived to be quite necessary to secure data which will show how far the navigability of the river may be affected by withdrawals of water for irrigation purposes.

The rapid extension of rice culture in the Sacramento Valley is resulting in the diversion of water from the river in a constantly increasing volume.

Investigations to ascertain the quantity abstracted and its effect upon the river flow were commenced in the summer of 1917, and resumed in the season just past. All diversions are made by pumping directly from the river, the water being discharged into and carried to the lands by pipes or open ditches. A catalog of all pumping plants was made, containing considerable detailed information as to size, capacity, type of pump, and how operated. A table giving this information is inserted herewith.

It was endeavored to make the list complete and it is believed that no important diversion has been omitted, but it was not possible to make graphic records of the quantity of water taken, and that information is largely obtained from statements made by those in charge.

Owing to the difficulty of holding experienced hydrographers, several changes in the party having occurred by reason of the men being called to the colors, the work was greatly restricted in scope from that which had been desired.

One result of the curtailment was that no investigations were made below Knights Landing this year.

Analysis of the data set forth in the annexed table will not be presented at this time.

A conflict believed by the department to be impending between interests using the waters of the Sacramento Valley is discussed under the title Conflict of Interests, page 70.

Pumping Plants on Sacramento River Between Tehama and Knights Landing.

(a) Location		Owner	(b) Power		(c) Pumps			Capacity G. P. M.	(d) Acre-ft. Diversion
Mi.	Place		Type	H. P.	No.	Size	Type		
176	R	Town of Tehama	Electric	-------	1	4″	Horizontal centrifugal	--------	11
154	--------	Sacramento Valley Irrigation Company	Electric	350	3	84″	Screw.		
154	--------	Sacramento Valley Irrigation Company	Electric	250	1	84″	Screw.		
154	--------	Sacramento Valley Irrigation Company	Electric	225	1	48″	Horizontal centrifugal	360,000	170,663
154	--------	Sacramento Valley Irrigation Company	Electric	350	1	50″	Horizontal centrifugal.		
154	--------	Sacramento Valley Irrigation Company	Electric	350	1	50″	Horizontal centrifugal.		
152	--------	Holecek Brothers	Electric	15	1	6″	C. C. L.	1,500	45
151½	--------	Sacramento Valley Sugar Company	Electric	150	2	18″	Vertical centrifugal	ea. 9,000	--------
151½	--------	Sacramento Valley Sugar Company	Electric	50	1	12″	Vertical centrifugal	4,500	5,730
151½	--------	J. Noia	Gas	15	1	6″	Vertical centrifugal	1,050	24
147½	L	Walker & Crassey Rovney Hop Ranch	Electric	15	1	6″	Horizontal centrifugal	900	120
147½	L	Walker & Crassey Rovney Hop Ranch	Electric	25	1	5″	Horizontal centrifugal	700	80
135½	--------	Phelan Estate	--------	-------	1	6″	Horizontal centrifugal	900	18
133	L	Frank Rico	Gas	25	1	10″	Horizontal centrifugal	900	20
128	R	W. H. Stewart	Tractor	20	1	6″	Horizontal centrifugal	1,800	52
126	R	C. L. Leonard	Electric	30	1	10″	Horizontal centrifugal	3,000	2,190
124.3	R	D. A. Shellove	Electric	75	1	15″	Horizontal centrifugal	10,000	4,000
124.2	R	Provident Irrigation District	Electric	2,000	4	42″	Horizontal centrifugal	72,000	100,000
123.8	R	Gallwick	Electric	15	1	6″	Horizontal centrifugal	900	Idle
116.9	L	M. J. Jones	Gas	15	1	6″	Horizontal centrifugal	900	Idle
116.5	L	M. J. Jones	Electric	-------	1	12″	Horizontal centrifugal	1,400	30
116	L	Butte City	Electric	5	1	5″	Plunger	35	56
115.5	L	E. L. Steele	Electric	50	1	12″	Horizontal centrifugal	450	120
112.7	R	Princeton-Colusa-Glenn Irrigation District	Electric	200	1	30″	Horizontal centrifugal	35,000	20,539
111.8	L	Moulton Irrigated Land Company	Electric	400	1	50″	Horizontal centrifugal	75,080	--------
111.8	L	Moulton Irrigated Land Company	Electric	150	1	30″	Horizontal centrifugal	35,000	--------
111.8	L	Moulton Irrigated Land Company	Electric	100	1	24″	Horizontal centrifugal	22,000	53,789
109.2	R	W. A. Xerxa	Electric	50	1	16″	Horizontal centrifugal	8,000	450
105	L	Moulton Irrigated Land Company	Electric	150	1	24″	Horizontal centrifugal	12,000	1,484
104	L	Rice Land and Products Company	Electric	300	2	24″	Horizontal centrifugal	30,000	--------
104	L	Rice Land and Products Company	Electric	250	1	36″	Horizontal centrifugal	50,000	11,555
103	R	Colusa Irrigation District	Electric	150	2	18″	Horizontal centrifugal	20,000	--------
103	R	Colusa Irrigation District	Electric	400	2	30″	Horizontal centrifugal	70,000	--------
103	R	Colusa Irrigation District	Electric	300	1	36″	Horizontal centrifugal	50,000	59,520
101.9	L	B. D. Beckwith	Electric	50	1	12″	Horizontal centrifugal	45,000	Idle
101	R	A. F. and R. C. Wahlfrom	Electric	75	1	18″	Horizontal centrifugal	10,000	440
99.8	L	D. George	Electric	50	1	12″	Horizontal centrifugal	4,500	700
99	R	Cheney Slough Project	Electric	300	1	36″	Horizontal centrifugal	34,000	--------
99	R	Cheney Slough Project	Electric	150	1	26″	Horizontal centrifugal	18,000	--------
99	R	Cheney Slough Project	Electric	200	1	26″	Horizontal centrifugal	20,500	37,133
98.8	L	J. K. Weast	Electric	50	1	18″	Horizontal centrifugal	10,000	1,811
98.7	L	O. Poirier	Electric	75	1	15″	Horizontal centrifugal	7,000	933
95.8	L	Mrs. B. Graham	Electric	100	1	20″	Horizontal centrifugal	13,000	1,160

95.8	L	Mrs. B. Graham	Electric	75	1	15″	Horizontal centrifugal	7,000	622
95.8	R	I. G. Zumwalt	Electric	50	1	12″	Horizontal centrifugal	4,500	740
95.7	L	A. N. Lewis Estate	Electric	75	1	15″	Horizontal centrifugal	7,000	--------
95.7	L	W. B. Boggs	Electric	50					
94.6	R	W. M. Pinney	Electric	50	1	12″	Horizontal centrifugal	4,500	323
94.3	R	Tuttle & Tubbs	Electric	50	1	15″	Horizontal centrifugal	7,000	2,592
93.2	R	V. W. Brown	Tractor	40	1	12″	Horizontal centrifugal	4,500	225
92.5	L	Unknown	Tractor	------	------	6″	Horizontal centrifugal.		
91.4	L	Moulton Irrigated Land Company	Electric	100	1	20″	Horizontal centrifugal	11,000	2,383
90.5	R	Roberts Ditch Irrigation Company	Electric	100	1	20″	Horizontal centrifugal	13,000	4,727
89.8	R	Colusa City	Electric	------	1	------	Vertical plunger.		
89.8	L	T. H. Boggs	Electric	50	1	12″	Horizontal centrifugal	4,500	200
89.4	L	Burke & Mitchell	Electric	75	1	15″	Horizontal centrifugal	7,000	1,448
89.3	R	Colusa Irrigation Company	Electric	150	1	20″	Horizontal centrifugal	14,000	3,223
87.7	R	Sutton & Montgomery	Electric	50	1	12″	Horizontal centrifugal	4,500	333
87.3	R	Campbell & Dwyer	Electric	75	1	15″	Horizontal centrifugal	7,000	933
87	R	Campbell & Dwyer	Electric	75	1	15″	Horizontal centrifugal	7,000	1,649
86	R	Cal. Ewing	Electric	25	1	12″	Horizontal centrifugal	4,500	Idle
83.5	L	P. E. Garmire	Electric.						
81	R	A. Steidlmire	Tractor	75	1	12″	Horizontal centrifugal	4,500	33
80.1	L	Alameda Sugar Company	Electric	100	1	18″	Horizontal centrifugal	10,000	2,000
79.2	L	C. E. Reische	Electric	35	1	10″	Horizontal centrifugal	3,000	210
78.2	R	George Davis	Steam	------	------	------	------	------	Idle
78	L	E. V. Jacobs	Electric	------	1	12″	Horizontal centrifugal	4,500	80
76	L	J. H. Yates	Electric	35	1	10″	Horizontal centrifugal	3,000	122
73.3	R	E. B. Vann	Electric	50	1	12″	Horizontal centrifugal	4,500	200
71.8	R	Sacramento Valley Sugar Company	Electric	100	1	15″	Horizontal centrifugal	7,000	Idle
71.3	L	Alameda Sugar Company	Electric	100	1	18″	Horizontal centrifugal	10,000	Idle
71	R	Unknown	Electric	150	1	15″	Horizontal centrifugal	7,000	--------
70.7	R	Town of Grimes	Electric	5	1	4″	Vertical plunger	--------	11
70.3	R	W. W. Kilgore	Electric	40	1	12″	Horizontal centrifugal	4,500	200
69.4	R	Faxon & Montague	Electric	75	1	18″	Horizontal centrifugal	8,000	1,067
69.1	R	J. W. Browning	Electric	150	1	30″	Horizontal centrifugal	30,000	2,600
66.9	L	Victor Massey	Gas	75	1	18″	Horizontal centrifugal	10,000	--------
64.4	L	Victor Massey	Gas	40	1	12″	Horizontal centrifugal	4,500	--------
63	R	W. M. Baker	Gas	16	1	18″	Horizontal centrifugal	1,600	--------
63.3	R	Reclamation District No. 108	Electric	100	1	26″	Horizontal centrifugal	30,000	4,266
63.3	R	Reclamation District No. 108	Gravity	------	6	------	Concrete culverts	--------	17,762
60.3	L	A. Kimineerer	------	------	1	12″	Horizontal centrifugal.		
55.5	L	O. T. Spencer	Electric	75	1	20″	Horizontal centrifugal	14,000	--------
54.3	R	E. J. Miller	Electric	40	1	12″	Horizontal centrifugal	4,500	70
48.5	L	P. J. Hiatt	Electric	50	1	12″	Horizontal centrifugal	4,500	90
44.1	R	Reclamation District No. 108	Electric	150	1	8″	Horizontal centrifugal	32,500	2,592
43.2	R	River Garden Farms Company	Electric	250	1	26″	Horizontal centrifugal	25,000	3,333
37	R	River Garden Farms Company	Electric	75	1	15″	Horizontal centrifugal	7,000	467
37	R	River Garden Farms Company	Electric	125	1	20″	Horizontal centrifugal	14,000	2,432

(a) Location, in miles, by river from Sacramento city. (b) Power: Electric signifies electric-driven; gas = internal combustion engine; H. P. = horsepower. (c) Pumps; No. = number of pumps; Size = inches in diameter of discharge. (d) Division: The figures representing quantity diverted during the season of 1918 are from statements of owners or attendants.

THE DEBRIS PROBLEM.

The United States Debris Commission, created by the Caminetti Act of 1893, has already been referred to herein under the caption, ''Sacramento River Problems.''

The commission is composed of three officers of the Engineer Corps, U. S. Army, and its duties prescribed by the act are, briefly stated:

(1) To regulate hydraulic mining so as to prevent, in so far as practicable, debris reaching the navigable streams.
(2) To design and execute plans for the amelioration of conditions unfavorably affecting navigation in the streams under its charge.

Its jurisdiction extends to the entire drainage area of the Sacramento and San Joaquin rivers.

In pursuit of its duties under the first definition above, the commission prescribes regulations for the storage or control of debris from mines and issues licenses for their operation when the regulations are complied with, and revokes licenses already issued for violations of the conditions prescribed.

Performing the second duty prescribed, the commission devised measures for the arrest of an immense volume of debris lodged in the canyons of the Yuba, which in the natural course would eventually reach the Sacramento River, and formulated the plan for the control of floods, protection of lands, and improve navigable conditions in the Sacramento River. The plan has been fully described in previous reports of this department and referred to in a previous paragraph herein. (See Sacramento River Problems, *ante*.)

The report of the commission is made annually to the War Department and is published in the reports of the Chief of Engineers, U. S. Army.

The state has contributed one-half the cost of the works on the Yuba River and has adopted the plans for flood control and river improvement and contributed funds equal to the congressional appropriations for carrying out the plans.

The State Engineer is enjoined by law to co-operate with the Debris Commission in all matters wherein the state is concerned.

The work of improving inland waterways and assisting navigation thereon, other than in connection with debris control, is also delegated to army engineers and the reports of their operations appear in the report of the Chief of Engineers contemporaneously with the Debris Commission's report.

These reports contain a large amount of valuable and interesting information and this department has heretofore reproduced them in full, and it is keenly regretted that limitations placed upon the state's publications restricts their appearance to a summary of their prominent features.

Owing to certain regulations of the War Department, information of a later date than June 30, 1917, is not available for publication at the time the text of this report is transmitted to the printer.

In the matters treated of and set forth in the summary of the reports to follow this, the Department of Engineering for the state has procured, or is negotiating for, rights of way and easements on the Sacramento and San Joaquin rivers and Stockton Harbor necessary for the work described in the reports and referred to in the summary.

SUMMARY OF REPORT OF DEBRIS COMMISSION JULY 1, 1915, TO JUNE 30, 1917.

During this period, the commission consisted of Col. Thomas H. Rees (senior member) to February 1, 1917; succeeded by Col. Edw. Burr (senior member); Major L. H. Rand (secretary), having immediate supervision of the work; Major Richard Park, Corps of Engineers.

1. Regulation of Hydraulic Mining.

From the date of its organization to June 30, 1916, the commission received 915 applications for licenses to operate hydraulic mines, and 90 licenses were issued. Prior to September 6, 1917, the commission had permitted brush and log crib dams to be constructed, but since then only dams of permanent construction have been allowed. During the year ending June 30, 1917, seven applications were received, making the total 922, five licenses issued and three revoked. Total number of mines operating, 14.

Hydraulic Dredges. Fifty-five hydraulic dredges, turning over 40,000,000 cubic yards of earth and gravel a year, are mining for gold along the streams. Of these, four are operating under permits issued by the Secretary of War. All dredges are required to prevent their debris reaching the streams.

Quartz Mills. Tailings from mills crushing quartz for the extraction of metals, particularly gold and copper, sometimes are washed into the navigable waters. Owners are, therefore, required to impound the tailings or debris. Twelve mills were required to take steps to care for their debris.

Illegal Mining. Very few hydraulic mines are reported as violating the law by operating without license. Two cases were reported to the federal grand jury, resulting in one indictment. The accused pleaded guilty in the United States Court and was fined.

2. Studies and Reports.

Survey of the Sacramento above Chico Landing was commenced in May, 1916, and general studies continued of the other streams affected by the debris. Projects for reclamation conducted under the supervision of the State Reclamation Board have been examined to see that they conform to the great flood control project. The expenses of the commission's operations under 1 and 2, above, were $14,977.59 in 1915–16, and $15,340.72 for the fiscal years 1916–17. The entire cost is borne by the government. The total appropriations for these purposes to June, 1917, amounts to $304,001.98.

3. Yuba River.

The project to hold and control the large accumulation of debris in this stream consists of a barrier across the mouth of the cañon, impounding a large volume of debris; the construction of an artificial channel for the river through Daguerre Point; construction of training walls from the Daguerre Point Cut to the confluence with Feather River at Marysville, so as to confine the Yuba River to a defined channel through an immense bed of debris. A fund of $800,000 was created for this project, the state and Congress each contributing $400,000.

Repairs and improvements were made to the inlet wall in Daguerre Point Cut; protective revetment placed at points on the training walls where being eroded; 2,200 feet of additional training walls above Daguerre Point Cut partly completed; embankments constructed across some high-water channels diverting from the river; the prescribed channel way from the lower end of the training walls to Marysville cleared of snags, trees and brush, and some blasting of hardpan done to expedite the deepening of the channel by scouring. Surveys were made to determine the effects of the works on the river.

The expenditures itemized for the two years aggregate $23,897.09, which leaves a balance of $88,569.20 in the co-operative fund July 1, 1917.

4. Sacramento and Feather Rivers.[1]

Operations for the alleviation of debris conditions in the Sacramento and Feather rivers have been conducted under joint agreements between the state and government. The original estimate for this work was $800,000, but changed conditions have caused a revision of the estimate to $1,660,000, not including rights of way and easements, or maintenance. The appropriations to date amount to $1,360,000, each participant contributing one-half.

Operations on the Lower Sacramento. During the two years 1916–17, the two hydraulic dredges, Sacramento and San Joaquin, belonging to the project, were continued in operation, removing 14,973,262 cubic yards of material from the river channel, at an average cost of 3.1 cents a cubic yard. A hired bucket dredge was employed to breach old levees and to construct embankments for retaining spoil deposits. This machine handled 1,001,782 cubic yards at a cost of $31,913.60, or at an average cost of 3.2 cents a cubic yard.[2]

The cost of the project to June 30, 1917, amounted to $1,353,936.53, including $444,253.90 paid for the two dredges and their equipment.

5. Control of Floods, etc.

A map was prepared showing lands required for cutoff across the bend at Collins Eddy, contemplated in the flood control plan. It is estimated that the excavation will cost $38,000[3]. Maps were also made showing lands required for the operations on the lower project. None of these maps have been published.

IMPROVEMENT OF SACRAMENTO AND FEATHER RIVERS AND SAN JOAQUIN RIVER AND TRIBUTARIES.

Sacramento River.

Sacramento-Feather Rivers Board. This board, appointed by the Secretary of War, under authority of the Rivers and Harbor Act, June 3, 1896, has charge of the improvement of the Sacramento and Feather rivers. The personnel is the same as that of the Debris Commission, with Major Rand as executive officer, who exercises immediate supervision of the work.

Sacramento River. The project is to maintain navigable depths from the mouth of the river to Sacramento City, 60.7 miles; 4 feet between Sacramento and Colusa, 90 miles; 3 feet to Chico Landing, 51.3 miles, and such depths as are practicable 51.6 miles to Red Bluff, 254.4 miles from the mouth. These results are to be obtained by a system of wing dams to concentrate the low water flow, by snagging and by occasional dredging.

It has been recommended that the channel depth to be attained be increased from 7 to 9 feet below Sacramento City.

Operations. During the two years, July 1, 1915, to June 30, 1917, snagging operations were carried on from the mouth to Tehama above Chico Landing, involving the removal from the river and destruction of snags, removal of overhanging trees from the banks and destruction of drift logs and trees lodged on banks and bars. The total removals were as follows:

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[1] Operations beneficial to Feather River were confined to the work on Yuba River noted under 2 above.

[2] The Department of Engineering invites attention to these costs of dredger work in contrast with the prices usually paid on contracts.

[3] This cutoff has been completed since the report.

	1916	1917
Snags	1,975	3,046
Trees	1,341	2,771
Drifts	----	1,635
	3,316	7,452

The cost of removing these obstructions, aggregating 10,768 in number, was $64,257.43.

Six new wing dams were constructed and repairs made to 39 others.

Dredging was necessary both seasons, both below and above Sacramento, which was done with dredges hired for the purpose. Snagging is done by a government snag boat.

Soundings were made and platted for progressive record of conditions in the river.

Survey Above Chico Landing. The river and harbor act approved March 4, 1915, directed a survey to be made of the Sacramento River from Chico Landing to Red Bluff. This was done and the district officer reported, recommending that no further attempts be made to improve the river above Chico Landing. (House Document No. 1893, 64th Cong., 1st Session.)

Financial Summary. Total appropriations to June 30, 1914, $1,327,000. Amount expended on *all* projects to June 30, 1917, exclusive of receipts from sales, etc., formerly included, amounting to $1,942.07:

New work	$37,212 71
New work and maintenance	[3]738,918 14
Maintenance	459,786 85
Total expended	$1,235,917 70

It is estimated that the state of California, the city of Sacramento and reclamation interests have expended approximately $3,000,000 in work beneficial to navigation.

Effect of Improvement. The effect of the improvement is that there is continuous navigation from the mouth of the river to Chico Landing. From San Francisco to Sacramento there are four daily (except Sunday), one weekly, and two semiweekly steamers. To Colusa, there are four weekly steamers, and to Chico Landing one weekly steamer from San Francisco. A gas passenger launch runs daily between Sacramento and Antioch and Stockton.

One hundred fifty-seven registered vessels and 101 unregistered of all kinds, steamers, gas boats (including tow boats), launches, gas schooners, sailing vessels and unrigged vessels, such a barges, dredges, etc., ply upon the Sacramento River either regularly or as occasion requires.

Traffic Statistics. In 1915 there were 766,935 tons of freight carried on the Sacramento River, and in 1916 there were 875,780 tons transported. The record for five years appears as follows:

Year	Short tons	Value
1912	477,292	$27,755,325
1913	733,594	35,856,791
1914	721,090	38,211,700
1915	766,935	38,027,703
1916	875,780	46,908,093

All of the river which is used for navigation is under improvement, hence all the traffic is considered as being affected by the improvement.

Feather River.

Project of Improvement. Work by the government for improvement of Feather River was discontinued in 1899[4] "until the flow of sand and other mining detritus from Yuba and Bear rivers is stopped." The river and harbor act approved July 27,

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[3] Cost of new work and maintenance were not kept separate prior to March 3, 1899.

[4] Annual report Chief of Engineers, U. S. Army, 1899, page 3171.

1916, appropriated $10,000 for improvement of this river, contingent upon a like sum being furnished by local interests. Those conditions were met.[5] The plan of improvement is to make a depth of 2.5 feet available at low-water stage, from Marysville to the mouth of the river at Vernon, a distance of 28.3 miles.

Operations. During the fiscal year ending June 30, 1917, work of clearing the channel was conducted, in which obstructions were removed as follows:

Snags	190
Overhanging trees	487
Drifts	171
Total	848

This work cost $1,259.71. Surveys and soundings of portions of the river were made and platted at a cost of $175.

Local Co-operation. Considerable work has been done by local interests in construction of training walls, barriers, bank protection and snagging, and the erection of terminal facilities at Marysville.[6] It is estimated that about $1000 has been expended.

Commercial Statistics. A table showing traffic on the river is presented as follows:

Year	Short tons	Value
1912	2,729	$159,016
1913	3,332	207,366
1914	----	------
1915	2,906	------
1916	392	------

The slump in tonnage in 1916 is attributed to several causes—a strike of river men, delay in getting harvests to the river before the low water, etc.

San Joaquin River.

Projects. The general project extends from the mouth to Hills Ferry, 128.5 miles, and embraces several projects for improvement, including a channel depth of 9 feet below Stockton and improvement by cut-offs; improvement of Stockton, Mormon and Fremont channels and McLeod Lake, all parts of Stockton Harbor; the improvement of the river above Stockton, and maintenance of the Mormon Slough—Calaveras Diverting Canal.

The 9-Foot Channel. The lower 34 miles of the river has always been more than the required depth. Stockton Channel 2½ miles and San Joaquin River 8½ miles required deepening. Below Stockton there had previously been made thirteen river-bend cut-offs, three by the state and two included in the 9-foot project. The elimination of the bends shortened the channel distance 6 miles, increased the scouring effects of the tide and reduced the flood plane.

Upper River Channel. From Stockton to Hills Ferry is 83.3 miles, to which point the river is navigable for boats of 5 feet draft from about April to August.

In 1915–16 the government snag boat Seizer was employed in snagging from Stockton to Patterson Landing, 64 miles. The following year snagging operations were conducted by a crew operating from a houseboat. The territory covered was from the San Joaquin River (Southern Pacific Railroad) bridge to Patterson Pump, a distance of about 50 miles.

Dredging Below Stockton. During the two years Cut-off "C" was completed by the dredging of 40,200 cubic yards of material. Cut-off "B" was made with one of the Sacramento River dredges transferred for that purpose. In making the cut-off, 433,925 cubic yards were removed at a cost of $14,989.26 (3.45 cents a yard). These two cuts shorten the channel .93 mile.

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[5] $5,000 were allotted from the Department of Engineering river fund and Sutter and Yuba counties contributed $2,500 each.

[6] The Department of Engineering had endeavored to improve conditions by training walls and snagging, removing more than 1,000 snags in one season. The result was that steamers were able to reach Marysville until August, which accounts for the figures of traffic in the table. Extremely low water after the department ceased work interfered with traffic.

The lower 3000 feet of Stockton Channel and the river for 2500 feet below the junction were dredged to a depth of 9 to 10 feet and 100 feet wide. The work was done by a suction dredge under contract at 18.4 cents a cubic yard. The total cost, including superintendence, inspection, etc., was $12,050.05.

Contracts were let for dredging at several points below Stockton, and one subdivision of the work completed.

Surveys. Surveys and office work were executed in preparing maps and descriptions for further improvement along Stockton Channel and the river for 10 miles below the city.

Expenditures. The expenditures for the fiscal years 1915–16 and 1916–17 were:

For the San Joaquin River, 9-foot project	$29,963 96
For Stockton Harbor channels	20,033 95
Total	$49,997 91

Results of Operations. The results of the operations recited are:

The river is navigable to Hills Ferry, 128½ miles from the mouth, for boats drawing 5 feet until about August;

The harbor of Stockton has a governing depth of 9 feet, excepting Mormon Channel, which is 4 feet deep;

The river below Stockton has a general depth of 9 feet. The cut-offs have shortened the channel length, eliminated many short bends, thus lessening danger in foggy weather, and stabilized running schedules in addition to lowering the flood plane and increasing the deepening action of tidal currents.

Appropriations. The appropriations and allotments made by the government for the purposes discussed, from 1876 to June 30, 1917, were as follows:

For San Joaquin River, 9-foot project	$169,632
For Stockton Harbor channels	722,170
Total	$891,802

Commercial Statistics. The vessels using the San Joaquin River are classified as follows:

Registered steamers	20	
Gas boats	85	
Sailing	25	
		130
Unregistered gas boats	14	
Sail	2	
Unrigged	54	
		70
Total		200

In 1915, boats on the river carried 831,234 tons of freight, and in 1916 there were 824,222 tons transported. The record of river transportation for five years appears as follows:

Year	Short tons	Value
1912	632,591	$38,854,539
1913	820,399	38,341,174
1914	772,156	35,479,741
1915	831,234	36,358,240
1916	824,222	42,179,160

Mormon Slough-Calaveras Diverting Canal.

The Project. This canal was constructed some years ago to divert the waters of Mormon Slough around north of Stockton into Calaveras River to prevent them carrying sand and detritus into Mormon Channel and the San Joaquin, at Stockton.

Operations for the Years 1915–17. The work has consisted of clearing a growth of brush from the channel of Calaveras River and the canal. It was done by hired labor at a cost of $3,983.19. The total expenditures to June 30, 1917, was $250,477.53.

Co-operation. It was required that right of way should be furnished free, which was done by the state and the city of Stockton, jointly.

Effect of Improvement. The deposits in Stockton and Mormon channels since the completion of the canal have been less than formerly. It is quite certain that without the canal the flood of 1911 would have caused great damage to navigation.

Mokelumne River.

Existing Project. The object of the project is to maintain navigable depths as follows:

	Depth	Miles
From the mouth of river to the confluence of North and South Forks	9	4
North Fork, from confluence to Snodgrass Slough	9	8
From Snodgrass Slough to forks of river	6	1
South Fork, from junction to forks at Newhope Landing	9	14
From Newhope Landing to Galt-Newhope Bridge	3	8

Operations. A clam-shell dredge was hired a short time each year in removing a shoal and bar near Newhope Landing, increasing the depth from 3½ to 6 feet. The total cost was $1,359.75.

Local Co-operation. Appropriation acts in 1892 and 1894 stipulated that a certain drainage canal near Newhope Landing should be closed, which was done. About 1904 the state spent $10,000 and private parties claimed to have expended $40,000 on improvement. In 1910 the state of California spent $22,782.39 on improvements. Additional work done in 1911 by private parties.

Commercial Statistics. The record of traffic on the river for five years is as follows:

Year	Short tons	Value
1912	50,443	$2,833,704
1913	90,585	5,079,932
1914	69,783	3,045,870
1915	88,624	4,033,698
1916	80,871	5,202,847

Appropriations and Expenditures. The total appropriations from 1884 to June 30, 1917, were $32,500, and the total expenditures for the same period were $31,500.

WATER RESOURCES.

Investigation, measurement and cataloging of the water resources of the state have been diligently prosecuted for many years by private interests seeking to take advantage of the loose laws to appropriate the waters to private exploitation.

It was not until recent years that the public awoke to the fact that the vast resources of the state, residing in the potential waters of its rivers, brooks and waterfalls, its lakes and glaciers, were fast passing to private ownership, and interposed a staying hand by enacting the conservation laws of 1911.

The government had been engaged in a small way in gathering data as to stream flow, but not until co-operation was established with the state did this character of research assume a degree of activity at all in keeping with its importance to the public.

When the Department of Engineering was created and entrusted with the task of representing the state in these matters, the work of gathering

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NOTE.—The state expended $60,000 and the city of Stockton about $26,000 in obtaining rights of way for the diverting canal.

nformation began to expand, and by 1909 there were 70 gaging stations established on the streams of the state. That was not many when the extent of territory and mileage of stream is considered, but by co-operating and uniting the funds of state and nation the work was prosecuted and data began to accumulate.

Records of stream flow are highly important, indeed absolutely necessary, in devising projects for irrigation, reclamation, flood control, power development, and navigation, or in fact any use to which flowing water may be devoted. The lack of complete records is keenly felt by the Department of Engineering and all others in attempting to solve the many problems of hydroeconomics so vital to the prosperity of the state.

The need for correct information concerning stream flow was never more clearly manifested than in the preparation of plans for the control of floods and reclamation of overflowed lands in Sacramento Valley. A comprehensive scheme was worked out from the best data extant at the time by eminent men who had had great experience in such matters in the Mississippi Valley. This was before the government and the state had inaugurated extensive investigations.

Work on small units of the plan had been started when it was discovered by actual measurements that the quantity of water to be cared for was *four times* as much as the proposed works were intended to handle.

The works now being constructed will control five times as much water as had been thought could be the possible maximum.

The failure of many irrigation enterprises for lack of water after arge sums had been expended in constructing works, tells sadly of the ack of information which the co-operating agencies of the nation and state are sedulously engaged in gathering.

In addition to the arrangement whereby the United States and the state jointly measure the streams, the co-operation of individuals, corporations and municipalities having interest in certain streams is enlisted, thus enabling a much larger field to be covered than would be possible with the funds appropriated.

The last report showed that at the close of the fiscal year, June 30, 1916, there were 168 gaging stations being maintained. Since then 39 of these stations have been abandoned and 49 new ones established. Some of the abandonments were due to the withdrawal of private co-operation, but most of them because of the unimportance of the streams, or for the reason that a record had been completed for a period ong enough to furnish a reliable rating for the stream.

The results of the observations at the gaging stations established at various points on the streams of the state are published from time to time in the bulletins issued by the Geological Survey under the title of Water Supply Papers.

These published records give the following information:

Description of station, and of its characteristics.
List of discharge measurements, made on the stream above.
Table of daily gage heights at the station.
Table of daily discharges.
Table of monthly and yearly discharges and run-off.

The methods employed in making the measurements have been described in previous reports of this department and are so graphically set forth in the water supply publications that they need not be described here.

The investigations into the water resources of the state by the United States Geological Survey in co-operation with the state of California during the last biennial period have been conducted under the charge of Mr. N. C. Grover, chief hydraulic engineer, chief of the water resources branch, United States Geological Survey, by Mr. H. D. McGlashan, district engineer, whose report here follows:

REPORT TO THE DEPARTMENT OF ENGINEERING ON THE PROGRESS OF THE CO-OPERATIVE SURFACE WATER INVESTIGATIONS IN CALIFORNIA BY THE WATER RESOURCES BRANCH OF THE UNITED STATES GEOLOGICAL SULVEY FOR 1916-1918.

The co-operative investigation of the surface water resources of the state of California during the past two years has been maintained on practically the same basis as in former years. While the number of river measurement stations in actual operation has not materially changed during this period, it has been necessary to discontinue a few stations and establish several new ones to meet the special needs of the state. Numerous improvements have been made in station equipment which materially increase the accuracy of the records. The apportionment of the work throughout the several drainage basins has remained practically unchanged, except in the Great Basin drainage. In this area a number of new stations have been established, at the request of the Department of Engineering and the State Water Commission, in order to determine the water supply available for proposed irrigation districts in Surprise Valley and Honey Lake Basin.

The following table shows the river measurement stations maintained during the two-year period ending October 31, 1918. This list does not include stations maintained by private parties, for which complete records are furnished for publication in our Annual Progress Reports. The regular stations are distributed among the major drainage basins of the state, as follows: Sacramento, 17 per cent; San Joaquin, 32 per cent; South Pacific, 23 per cent; North Pacific, 8 per cent; Great Basin, 20 per cent.

Stream	Post Office
Alameda Creek	Niles
Alameda Creek	Alvarado
American River	Fairoaks
American River, Middle Fork	East Auburn
American River, North Fork	Colfax
American River, South Fork	Placerville
Arroyo Seco	Pasadena
Arroyo Seco	Soledad
Baxter Creek	Lassen
Bear Creek*	Springville
Bear River	Colfax
Bear River	Van Trent
Bidwell Creek, near	Fort Bidwell
Bidwell Creek, at	Fort Bidwell
Boulder Creek	Julian
Box Canyon Creek	Fort Bidwell
Cache Creek	Yolo
Calaveras River	Jenny Lind
Carson River, East Fork	Markleeville
Carson River, West Fork	Woodfords
Cherry Creek	Sequoia
Clear Lake	Lakeport
Cooks Lake	Fort Bidwell
Cowhead Lake	Fort Bidwell
Cosumnes River	Michigan Bar
Cosumnes River, North Fork	El Dorado
Coyote River	Madrone
Coyote River	Coyote
Coyote River	Edenvale
Coyote River*	San Jose
Cuyamaca Water Company's flume, at diverting dam	Lakeside
Cuyamaca Water Company's flume*	Lakeside
Deep Creek, above Dismal Creek	Warner Lake, Ore.
Deep Creek, below Dismal Creek	Warner Lake, Ore.
Deep Creek	Adel, Ore.
Deer Creek	Hot Springs
Dismal Creek	Fort Bidwell
Eaton Creek	Pasadena
Eel River	Scotia
Eleanor Creek	Sequoia
Elsinore Lake	Elsinore
Escondido Mutual Water Company's canal	Nellie
Falls Creek	Sequoia
Feather River	Oroville
Feather River, Middle Fork	Oroville
Feather River, Middle Fork	Sloat
Feather River, South Fork	Enterprise
Fifteen Mile Creek	Warner Lake, Ore.
Fish Creek	Duarte
Fresno River	Knowles
Fresno Flume and Lumber Company's flumes	Shaver
Gobernador Creek	Carpinteria
Golden Rock Ditch*	Sequoia
Goodyear Creek	Goodyear Bar
Haines Creek	Tujunga
Hat Creek*	Hat Creek
Horse Creek, East Fork	Fort Bidwell
Horse Creek, West Fork	Fort Bidwell
Indian Creek*	Crescent Mills
Indian Creek	Happy Camp
Janesville Creek	Lassen
Kaweah River	Three Rivers
Kaweah River, North Fork	Kaweah
Kaweah River, South Fork	Three Rivers
Keeno Creek	Fort Bidwell
Kern River	Kernville
Kings River	Sanger
Klamath River	Selad Valley
Klamath River	Requa
Kosk Creek*	Henderson
Laguna Seca	Coyote

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*Discontinued.

Stream	Post Office
Little Santa Anita Creek	Sierra Madre
Long Valley Creek	Scotts
Long Valley Creek	Doyle
Markleeville Creek, above	Markleeville
Markleeville Creek, at	Markleeville
McCloud River	Baird
Merced River, Happy Isles	Yosemite
Merced River*	Yosemite
Merced River, Pohono Bridge	Yosemite
Merced River	Exchequer
Merced River, South Fork	Wawona
Middle Eel River	Covelo
Modesto Canal	La Grange
Mokelumne River	Clements
Mokelumne River, Licking Fork*	Railroad Flat
Mokelumne River, Middle Fork	West Point
Mokelumne River, North Fork	West Point
Mokelumne River, South Fork	Railroad Flat
Mono Lake	Mono Lake
Monrovia pipe line	Monrovia
Oakdale Canal	Knights Ferry
Oregon Creek	North San Juan
Owens Lake	Lone Pine
Owens River	Round Valley
Owens River	Big Pine
Owens River	Lone Pine
Pacoima Creek	San Fernando
Palermo Land and Water Company's canal	Enterprise
Pine Creek	Alturas
Pine Creek	Round Valley
Pit River	Henderson
Pit River	Ydalpom
Putah Creek	Winters
Reeve-Davis ditch*	Happy Camp
Rock Creek	Fort Bidwell
Rock Creek	Goodyear Bar
Rock Creek	Round Valley
Rogers Creek	Azusa
Sacramento River	Castella
Sacramento River	Red Bluff
Salton Sea	Salton
San Antonio Creek	Claremont
San Diego*	Lakeside
San Diego River	Santee
San Diego River*	San Diego
San Dieguito River	Barnardo
San Dimas Creek	San Dimas
San Gabriel River	Azusa
San Jacinto River	Elsinore
San Joaquin River	Friant
San Joaquin River	Newman
San Luis Rey River	Mesa Grande
San Luis Rey River*	Nellie
San Luis Rey River*	Pala
San Luis Rey River	Bonsal
Santa Ana River	Mentone
Santa Anita Creek	Sierra Madre
Santa Maria Creek	Ramona
Santa Ynez River	Santa Barbara
Santa Ynez River	Lompoc
Santa Ysabel Creek	Mesa Grande
Santa Ysabel Creek	Ramona
Sawpit Creek	Monrovia
Schloss Creek	Lassen
Scott River	Callahan
Scott River, East Fork	Callahan
Shasta River	Montague
Smith River, Middle Fork	Crescent City
Smith River, North Fork	Crescent City
South San Joaquin Canal	Knights Ferry
Southern California-Edison Company's Canal	Azusa

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*Discontinued.

Stream	Post Office
Southern California-Edison Company's Canal	Mentone
Spanish Creek	Keddie
Stanislaus River	Knights Ferry
Stanislaus River, North Fork	Avery
Stanislaus River, South Fork*	Strawberry
Stevenson Creek	Shaver
Susan River	Susanville
Sweetwater River*	Dehesa
Sweetwater River	Descanso
Tenaya Creek	Yosemite
Temescal Creek	Elsinore
Trinity River	Lewiston
Trinity River	Hoopa
Tujunga Creek	Sunland
Tulare Lake	Stratford
Tule River	Porterville
Tule River, South Fork	Porterville
Tuolumne River, below Hetch Hetchy damsite	Sequoia
Tuolumne River	Buck Meadows
Tuolumne River, above La Grange Dam	La Grange
Tuolumne River, at La Grange Dam	La Grange
Tuolumne River, Middle Fork	Buck Meadows
Tuolumne River, South Fork	Sequoia
Tuolumne River, South Fork	Buck Meadows
Turlock Canal	La Grange
Twelve-Mile Creek	Fort Bidwell
Twenty-Mile Creek	Warner Lake, Ore.
Utica Gold Mining Company's canal	Avery
West Walker River	Coleville
Yosemite Creek	Yosemite
Yosemite Power Company's canal	La Grange
Yuba River	Smartsville
Yuba River, Middle Fork	North San Juan
Yuba River, North Fork	Goodyear Bar
Yuba River, North Fork, North Fork	Downieville

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*Discontinued.

The above work has been maintained in accordance with co-operative agreements with the state of California, through the Department of Engineering and the State Water Commission; with the city and county of San Francisco, through M. M. O'Shaughnessy, city engineer; with Los Angeles County, through the board of supervisors, and with the U. S. Forest Service and the National Park Service. In addition, substantial assistance has been furnished by other federal bureaus and by state, county and municipal officers, irrigation districts, private companies, and individuals. The amount of work done and its cost, including estimated expenditures for complete records furnished free for publication, for the two-year period ending June 30, 1918, was as follows:

Drainage	Number of stations			Number of discharge measurements				Average annual cost per station, including new construction and office work
	Established	Discontinued	Maintained June 30, 1918	At regular stations	Miscellaneous	Total	Average at each station per year	
Sacramento	5	3	35	433	56	489	6	$164 00
San Joaquin	8	20	54	702	93	795	6	198 00
South Pacific	12	9	38	1,201	428	1,629	16	397 00
North Pacific	1	1	12	83	24	107	3	114 00
Great Basin	23	6	39	482	120	602	10	117 00
Totals	49	39	178	2,901	721	3,622	8	$198 00

The following Surface Water-Supply Papers, containing California records, have been published since November, 1916:

Paper 361, Annual Progress Report of California for the year ending September 30, 1913.

Paper 390, Annual Progress Report of Great Basin for the year ending September 30, 1914.

Paper 391, Annual Progress Report for California for the year ending September 30, 1914.

Paper 426. Southern California Floods of January, 1916.

Water-Supply Papers 410, 411 and 441, for the years 1915 and 1916, have been approved for printing and are expected to be available for distribution in a short time. All records for the year ending September 30, 1917, have been compiled and the results are available to the public. They will be published in Water-Supply Papers 460 and 461. Also this office has in preparation a special Southern California Report which will include all stream flow records collected by the Geological Survey in this section of the state.

In the administration of the work of the Water Resources Branch of the Geological Survey, the district office is maintained at 328 Custom House, San Francisco. A suboffice is retained at 619 Federal Building, Los Angeles, for the convenience of southern California. Data collected by all branches of the Geological Survey may be consulted at either office.

GROUND WATERS.

In few localities of the state are conditions so well adjusted that the surface waters are sufficiently under control as to adequately serve all the lands within their reach. In some localities no surface water at all is available.

Fortunately in many localities where the streams are wanting or inadequate, there are underground waters which may be obtained for irrigation, either supplemental to the surface supply, or in the latter's absence in lieu thereof.

Throughout the great desert region of the state lying to the east of the mountain ranges are small bodies of fertile arid land underlain at varying depths with water which can be made available for surface use by means of wells and modern pumping methods. Considerable areas have been brought under cultivation by these means. Such underground waters are also being developed in the most barren and forbidding portion of the desert and used for washing out gold by the hydraulic process.

The desert is rich in mineral resources, metals in the hills and potash, soda, borax, and other salts in the beds of dried-up lakes. The scarcity of water retards the development of the known deposits and ignorance of the location of infrequent springs and water holes on the part of miners, prospectors and explorers claims a toll of death every year.

Special effort has been put forward in late years by the co-operative agencies of nation and state to locate all waters, determine their quality for use, to mark their positions on maps and erect guideposts directing the thirsty traveler to them.

From August, 1917, to March, 1918, the desert survey covered more than 30,000 square miles, during which 356 guide signs were erected.

During the past biennium, as before, the ground water investigations were conducted by Mr. O. E. Meinzer, geologist in charge, Ground Water Division, under the direction of N. C. Grover, Chief Hydraulic Engineer. Mr. Meinzer's report is as follows:

REPORT TO THE DEPARTMENT OF ENGINEERING ON THE PROGRESS OF THE GROUND-WATER INVESTIGATIONS IN CALIFORNIA BY THE WATER RESOURCES BRANCH OF THE U. S. GEOLOGICAL SURVEY FOR 1916-1918, BY O. E. MEINZER, GEOLOGIST IN CHARGE, DIVISION OF GROUND WATERS.

The most important new project that was undertaken in the last biennial period was a survey of desert watering places throughout an area of 30,000 square miles, extending from the Mexican border northward to the southern part of Death Valley, by D. G. Thompson and J. S. Brown. The field work was begun in August, 1917, and completed in March, 1918. Most of this region was mapped by plane-table methods on a scale of 1:125,000. Nearly all watering places in the region were examined and samples for analysis were taken from many of them. Guides to watering places in this region are being prepared for publication. These guides will contain dependable maps showing the relief and the locations of the watering places and connecting roads. Signposts directing to watering places were erected at 167 localities, the total number of sign plates erected being 356.

On account of the conditions produced by the war, the field work on desert watering places could not be continued through the year 1918, but it is hoped that after the war it will be possible to extend this work over the rest of the desert portions of the state, and to make a resurvey of the desert region at regular intervals in order to keep the maps and signboards up to date and to make necessary repairs on existing signboards. The experience of the last year has shown that this work can be completed and maintained at very moderate cost. It is believed that its value to the people of the state is out of all proportion to its cost.

In 1918 a large part of the ground-water work in the state was done for the purpose of assisting the War and Navy departments of the federal government in developing the largely increased water supplies that were made necessary by the war. This war work was, of course, given preference over all other investigations.

A report on the ground-water supply for irrigation in the Morgan Hill area in Santa Clara Valley, by W. O. Clark, has been published as Water-Supply Paper 400-E.

A report on ground water in San Jacinto and Temecula basins, by G. A. Waring, has been completed and is now in press as Water-Supply Paper 429.

A comprehensive report on the geology and ground water resources of the western slope of San Diego County, by A. J. Ellis and C. H. Lee, has been completed by the authors and is in process of publication as Water-Supply Paper 446.

A final report on ground water in Sacramento Valley, by Kirk Bryan, has also been completed and is in process of publication.

The final report on ground water in Santa Clara Valley, by W. O. Clark, is nearly completed. Measurements are being continued on water levels in wells in order to estimate the annual recharge, and records of stream flow are being obtained at several points on Coyote Creek in order to ascertain the amount of water that seeps into the ground and thus to obtain a check on the estimates based on fluctuations of water levels in wells.

A survey was begun by W. O. Clark of the ground water in Salinas Valley. The field work in this valley has been nearly completed but the report based on this field investigation has not yet been prepared.

A reconnaissance survey of ground water conditions in Pahrump, Mesquite, Ivanpah and Lanfair Valleys was made by G. A. Waring and D. G. Thompson, the results of which are to be published as a contribution to hydrology. A part of the area occupied by these valleys lies in Nevada.

A reconnaissance survey was also made by Messrs. Waring and Thompson of the ground water conditions in Mohave Valley and in several smaller valleys in the same region. The results of this survey are also to be published as a contribution to hydrology.

In connection with the desert watering-place survey by J. S. Brown, data were collected on artesian water conditions and on the prospects of developing additional ground water supplies in Imperial Valley near the Mexican border.

Since 1900 measurements of depths to water levels in a series of wells in southern California have been made at intervals for the purpose of obtaining a record through many years of the relation between the contribution to the ground water reservoirs during the rainy seasons and the withdrawals from them during the dry seasons when ground water is pumped for irrigation and is withdrawn in large quantities by evaporation and transpiration. Most of the records for the period prior to 1909 have been published in Water-Supply Papers 213 and 251. The records for 1909, 1910, and 1912, together with a brief discussion by W. C. Mendenhall, were published in Water-Supply Paper 331. The work is at present being carried on by F. C. Ebert, who is tabulating all available water level data of the region for publication in a water-supply paper.

IRRIGATION INQUIRY.

Under authority of the law establishing the Department of Engineering and prescribing its duties, agreements are entered into by the State Engineer and the United States Department of Agriculture for the co-operative investigation of problems connected with irrigation. The United States is represented in these matters by the Irrigation Division, Bureau of Public Roads, U. S. Department of Agriculture.

Mr. Frank Adams, Irrigation Manager, has continued in charge of the work, which is under the direction of Dr. Samuel Fortier, chief of the division. Mr. Adams' detailed report will be found under appropriate heading.

In former reports of this department, it has been repeatedly held that when irrigation shall come to be scientifically applied it will be found that in many cases a lesser quantity of water will accomplish full benefits, and if the application were restricted to actual requirements there would be a saving of water that could be applied to other lands.

The experiments on the State Farm at Davis have demonstrated that under the conditions of soil, climate and cost of water obtaining at that place, the application of more than 30 inches in depth of water to alfalfa is unprofitable, and that when 48 inches or more is applied, an actual loss occurs. Yet there are fields of alfalfa where natural conditions are similar to those at Davis, upon which water is used in greater quantities, entailing a substantial, even though unsuspected, loss of production.

PLATE IX.

Upper figure.—Concrete weir on Cross Creek built by Lake Lands Canal Company for iverting water into Lake Lands Canal under war emergency stipulation permitting temporary iversions of Kings River flood waters.

Lower figure.—Barley field on San Luis Obispo sewage farm.

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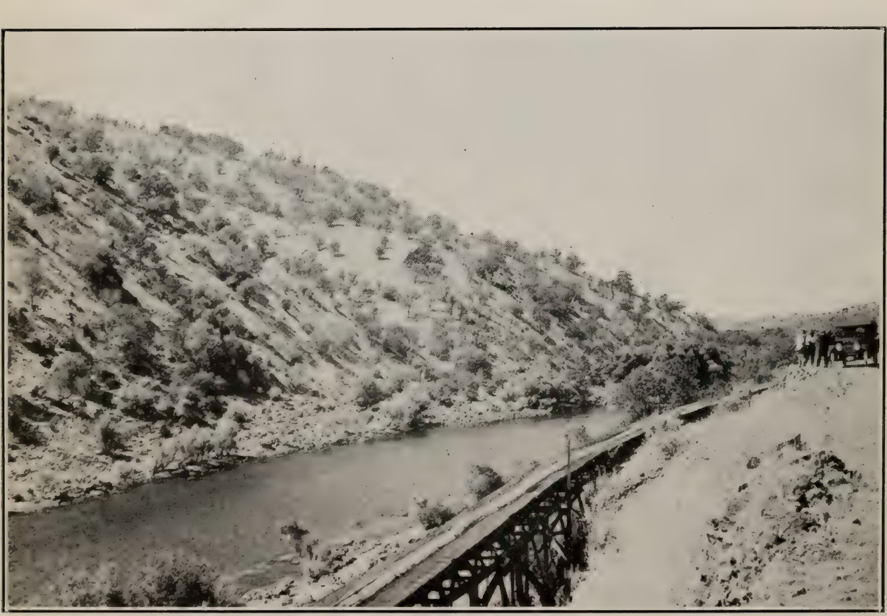
PLATE X.



Upper figure.—Portion of State Land Settlement Project at Durham.

Lower figure.—Proposed dam site for Pine Flat reservoir contemplated by Kings River Conservation Association.

Such excessive use of water is mostly due to lack of knowledge of crop requirements, which knowledge it is a function of the co-operative research being conducted to ascertain and publish. It goes without saying that when the irrigator becomes convinced that he can do better with less water than he has been accustomed to use, he will reform his practice.

A careful reading of the report is commended. It will be noted that already a marked increase in the duty of water for irrigation of rice is apparent. In localities where formerly 7.25 feet of water were used, results equally as good were later obtained with the application of 5.50 feet.

Several instances are cited wherein claimants of water which had not been theretofore fully utilized were induced from patriotic motives to release a portion of that water for the production of war crops on others' lands, thus making a considerable addition to food production without great injury to those who temporarily released the water.

The success of the efforts along this line as detailed in the report prompts the author to observe that it "indicated in a broad, general way that large opportunities exist for co-ordination of effort and reduction of waste arising from nonuse or misuse of irrigation water." He believes that through the efforts of the several agencies engaged, there was a more complete and more economical use of irrigation water than in any previous year, and is moved to ask: "When the war emergency is passed, can public sentiment be kept up to the point of holding to the principles found workable in 1918?" He recommends that a way be found to continue the effect of the emergency order of the Railroad Commission and the emergency act of the 1917 legislature under which these savings were accomplished.

The Department of Engineering believes that public sentiment can be so held, but holding to the "principles found workable" is a matter of education, and to educate the public, *i. e.*, the water-using public, to accept those principles is the object sought to be accomplished by the co-operative research under discussion.

The question now arises: Is not this matter of sufficient importance to warrant more activity in educational effort to inculcate the principles referred to? All of the co-operating agencies are anxious to extend their work, and are held back only by lack of funds.

This matter is commended for earnest consideration, and appeal made for adequate appropriation to enable the work to be vigorously prosecuted.

Some features of the report may be hereinafter referred to, but anticipating that the reader will give careful perusal to the entire report, further comment at this time is withheld and the report presented in full, as follows:

PROGRESS REPORT OF CO-OPERATIVE IRRIGATION INVESTIGATIONS IN CALIFORNIA, 1916-1918.

By FRANK ADAMS, Irrigation Manager.

Introduction.

During the past two years principal co-operating agencies in irrigation investigations in California have continued as heretofore, namely: Irrigation Investigations, now designated as Irrigation Division, U. S. Department of Agriculture; California State Department of Engineering; College of Agriculture of the University of California: and California State Water Commission. In special studies of rice irrigation we have continued to work with the Biggs Rice Experiment Station of the Cereal Investigations, Bureau of Plant Industry, U. S. Department of Agriculture. In studies of irrigation problems of particular communities, we have considerably increased co-operation with the farm advisers and farm bureaus of a number of the counties, chiefly Shasta, San Joaquin, El Dorado, Merced and Kern. In connection with increased food production in the interest of the war emergency a substantial measure of co-operative effort has been carried on with the United States Food Administration for California, the State Council of Defense, and the State Railroad Commission.

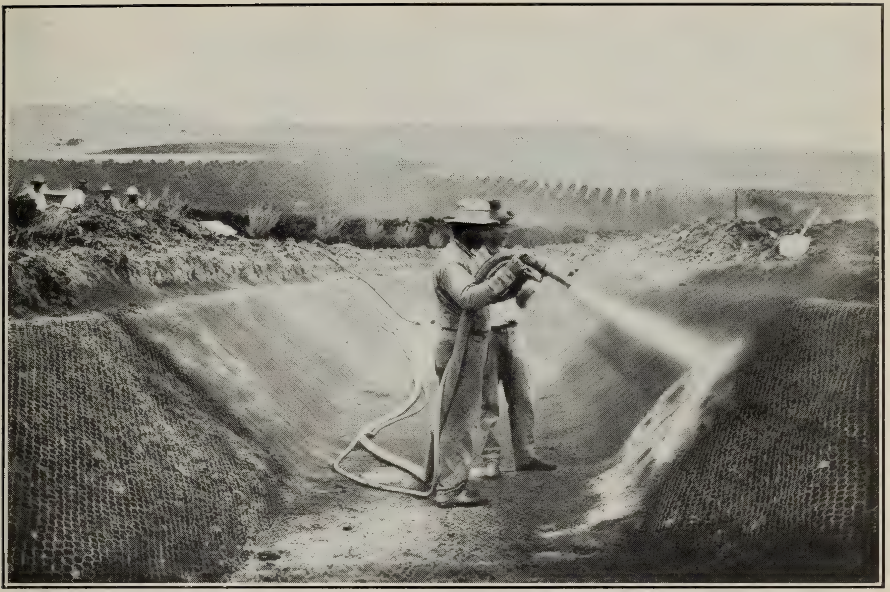
Reorganization and Personnel. As a result of the removal of headquarters of the Chief of the Irrigation Division of the U. S. Department of Agriculture from Washington to Berkeley in April, 1918, immediate supervision of co-operative irrigation investigations in California has automatically reverted to Dr. Samuel Fortier, Chief of the Irrigation Division. The writer is, however, continued in immediate charge of co-operation with the College of Agriculture of the University of California and of certain further projects within the state in connection with the other co-operative agencies named; also with the aid of Miss Reid M. Venable, office assistant, in charge of all records and data gathered through the California work. Special irrigation studies conducted on the University Farm at Davis, heretofore a part of the general co-operation in California, are now, because of their purely agricultural character, entirely paid for from College of Agriculture funds and are therefore not considered strictly part of the co-operative work and hence not reported. Mr. C. E. Tait, Senior Irrigation Engineer, is continued in charge of special studies in southern California.

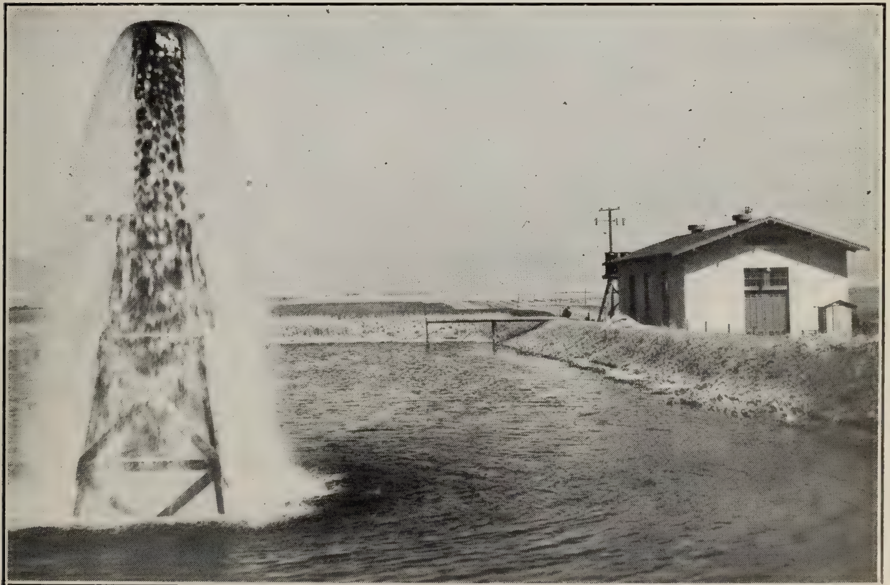
Irrigation and Increased War Production.

One of the major activities of our work during the past two seasons has been that concerned with the increase through irrigation of war food production. In these activities Professors S. H. Beckett and Frank J. Veihmeyer, of the irrigation investigations staff of the College of Agriculture, have taken an especially important part. The following indicates in a general way the nature and extent of the more important of these activities and what has been accomplished through them.

(1) On April 17, 1917, eleven days after the declaration of war, called a statewide conference at Berkeley to consider increasing the part of irrigation in war food production. This conference was attended by representatives of important community and commercial irrigation enterprises, by the Dean of the College of Agriculture of the University, and representatives of the following public agencies interested in or connected in an administrative way with California irrigation: State Department of Engineering, State Water Commission, State Railroad Commission, State Irrigation Board, Division of Rural Institutions of the College of Agriculture of the University of California, and California Co-operative Irrigation Investigations. Principal direct or indirected outcome: Decision No. 4278 of the State Railroad Commission removing legal restrictions on emergency deliveries of surplus irrigation water by utility water companies; emergency act (Act No. 1732K, 1917 legislature) drafted by the Water Commission and the Railroad Commission in conference with this office removing legal restrictions from emergency deliveries of irrigation water by individuals and mutual water companies.

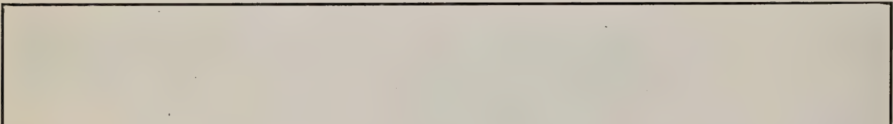
PLATE XI.





Upper figure.—Lining canal with cement gun, Lindsay-Strathmore District.
Lower figure.—Booster plant, Terrabella Irrigation District.

PLATE XII.



Upper figure.—Trenching for pipe line, Paradise Irrigation District.
Lower figure.—Double pipe line from pump, Westside Irrigation District.

(2) With the concurrence of the State Engineer and the Attorney General an appeal was sent through the State Council of Defense to irrigation districts urging emergency irrigation deliveries, whenever possible, to landowners outside of districts.

(3) Held numerous conferences with the principals involved in a controversy preventing access to irrigation water by Byron-Bethany Irrigation Company (only partially successful), followed by plane-table topographical survey of 2500 acres within the project and special study and report on the most economical preparation for irrigation of the land involved.

(4) Instituted investigation resulting, after numerous conferences, in co-operation with State Council of Defense, in the signing of a stipulation practically vacating, for the period of the war and a reasonable time thereafter, an injunction issued in 1903 against the opening of Lake Land flood water canal from Kings River, capable of watering at least 30,000 acres. A total of 2000 acres was actually irrigated under this stipulation in 1917 and at this writing it is expected that a considerable larger acreage will be benefited next season. The Lake Land Canal and Irrigation Company built a new permanent concrete weir across Cross Creek, at a cost of about $9,000, to handle water under the stipulation, has spent about $6,000 additional in canal improvements, and will do further work at a cost of about $10,000 looking to readiness for 1919. The stipulation signed permits Lake Land Canal to divert water when the flow in Kings River exceeds 8000 cubic feet per second. As this figure is excessive, an effort is likely to be made by the parties interested to alter the stipulation to permit diversions at any time there is waste water.

(5) Co-operated with State Council of Defense in effort to hasten irrigation of lands in Solano County under an abandoned promotion enterprise. No important results to date.

(6) Co-operated with motor and irrigation machinery supply houses in San Francisco by which a ruling was obtained from the War Priorities Board through the Federal Food Administration for California permitting the obtaining of priority orders for motors, engines, and pumps needed for irrigation of essential crops.

(7) Instituted investigation (July to August, 1917) of controversy between people of Lake County and Yolo Water and Power Company involving use of water of Clear Lake for irrigation. This was the basis for an agreement obtained April, 1918, by the Federal Food Administration for California, working in conjunction with this office, by which 10,000 acres of rice, not otherwise possible of growth in 1918, have been irrigated with an estimated yield in excess of 300,000 bags containing 30,000,000 pounds of rice. Throughout the irrigation season this project has been under the general supervision of Professor S. H. Beckett, acting in this matter as a representative of the Food Administration.

(8) Held several conferences with farmers and officials in Anderson-Cottonwood Irrigation District with a view to aiding in hastening use of water made available by Anderson-Cottonwood Irrigation District Canal. A small demonstration project was undertaken at Redding.

(9) In co-operation with Division of Rural Institutions of the College of Agriculture made emergency survey of irrigation resources of California and their better utilization during the war. Briefly this indicated:

(*a*) A probable addition of 100,000 acres in 1917 to the normal annual increase in the irrigated area in California.

(*b*) That canals and principal laterals were already constructed to water an additional 500,000 acres, with construction due to be completed by 1920 that would make irrigation available to 300,000 acres more.

(*c*) That reorganization and consolidation of existing irrigation enterprises, completion of irrigation works under way, efforts toward temporary or permanent adjustment of local irrigation controversies, and more complete and more careful ultilization of normal irrigation supplies have all been definitely stimulated by the war emergency.

(10) Made field survey of the possibility of increasing the area of irrigated wheat in California in both 1917 and 1918. The survey in 1917 indicated that a considerable opportunity existed in Imperial, San Joaquin and Sacramento valleys for increasing the irrigated wheat acreage of California as a war measure, but that owing to local attitude toward the irrigation of wheat, the largest increase in 1918 would likely be in San Joaquin Valley south of Fresno. The survey in 1918, made in August and September, showed less increase over 1917 than had been expected.

(11) Made a field investigation of opportunities for temporary utilization of water wasted into Auburn Ravine from power plant of Pacific Gas and Electric Company and gave publicity to findings.

(12) Investigated controversy regarding use of Clark Ditch in El Dorado County and aided in bringing water users and owner together.

(13) Made field investigation and assisted in settlement of controversy over distribution of irrigation water in Orangevale colony.

(14) Investigated grain suffering from drought under irrigation systems in Fresno, Tulare and Kings counties, and joined with Fresno County Food Administrator in enlisting co-operation of the Food Administration for California in obtaining consent of owners of alfalfa farms and orchards to give water for period of two weeks to save between 20,000 and 30,000 acres of wheat and barley. (Sudden high water in Kings River later reduced acuteness of this situation.)

(15) Made preliminary financial investigation of California irrigation, drainage and reclamation projects likely to undertake substantial expenditures during the war period. This investigation has been made to obtain information to assist in reporting on projects at the request of the Capital Issues Committee of the Twelfth Federal Reserve District. Subsequently, more complete reports were made on request of the Capital Issues Committee, through the Chief of the Irrigation Division, on fifteen of these enterprises in northern and central California.

(16) Acting for the Food Administration, made investigations of water shortage for rice under Sacramento Valley West Side Canal and recommended order, subsequently issued by the State Railroad Commission, placing supervision of water distribution under the entire system under a special representative of the Food Administration and the Railroad Commission for a ten-day period during the most acute shortage. Professor Frank J. Veihmeyer of our co-operative staff acted as such special representative, general supervision then being shifted to the County Food Administrator.

(17) Acting for the Food Administration, investigated a similar water shortage for rice in Oakdale Irrigation District and rearranged water deliveries to meet it.

(18) Acting in conjunction with the Power Administrator, secured the release of stored water for the irrigation of alfalfa and beans in Oakdale and South San Joaquin Irrigation districts.

(19) Acting for the Food Administration and in conjunction with Power Administrator, curtailed wasteful use of water in both Nevada City and Grass Valley, making the water thus saved available for food crops under the Excelsior Water and Mining Company's system in the Rough and Ready section of Nevada County; also acting for the Power Administrator, effected an economy in the use of water in mining in favor of the generation of hydroelectric power.

(20) Acting for the Power Administrator secured an agreement to conserve irrigation water in Browns Valley Irrigation District through rotating deliveries, the saving thus effected being available for power.

(21) Acting for the Food Administration and the Railroad Commission made adjustment of water deliveries in El Dorado County, under Western States and Diamond Ridge Ditch systems, to care for needs of essential food crops.

(22) Acting for the Food Administration and the Railroad Commission supervised the distribution of water under East Side Canal in Kern County during special emergency run of water provided to insure an additional crop of alfalfa on 2370 acres.

(23) Acting for the Food Administration investigated a proposed grain irrigation project under the Los Angeles aqueduct.

(24) Acting for the Food Administration investigated water shortage on Butte and Deer creeks, Butte County, and advised all users as to economies needed to save essential crops.

(25) Acting for Food Administration co-operated with the Railroad Commission and the Power Administrator in arranging for readjustments of water diversions from Feather River in Butte County by Sutter-Butte and Western Canal companies. This action was taken in connection with an acute water shortage in the rice fields irrigated from Sutter-Butte Canal and to furnish water needed to irrigate bean land prior to plantings.

(26) Rendered assistance to individuals and communities in laying out farm ditches and irrigation pipe lines, installing irrigation pumping plants, and preparing land for irrigation. This work was especially active during the early months of the war, twenty-five individual cases of this kind being handled during 1917, these covering a total of 2500 acres, and serving as centers of interest in the general food production campaign conducted by numerous public agencies.

(27) Investigated water shortage for rice irrigation west of the borrow pit of Reclamation District No. 108 in Yolo and Colusa counties due to scarcity of waste water from the irrigated areas about Colusa and north in Colusa and Glenn counties.

General Conclusions Regarding War Activities. Such work as we have been able to do in the interest of increased food production during the war period has indicated in a broad general way that large opportunities exist for co-ordination of effort and reduction of waste arising through nonuse or misuse of irrigation water. Due to the extreme water shortage during the past season in nearly every irrigation stream in the state, and to the disinterested activities of various public agencies, such as the Food Administration, the Railroad Commission and the State Council of Defense, there has, it is believed, been a more complete and more economical use of irrigation water than in any previous year. While in some cases individuals have patriotically suffered some monetary loss through the favoring of the more essential crops or through the temporary diversion of water from alfalfa or orchards to rice, beans, or some other annual crop at the moment requiring water if it were to be saved, such readjustments as have been made have not in general resulted in great hardship. In normal times those having a prior right to water and using it carefully can not be expected to give it up in favor of others merely because some crop more valuable for the minute can thereby be saved. But the experience of the year should be given emphasis as establishing an advance in the public point of view toward the right of individuals to waste irrigation water merely because the lower standards of earlier times, when many of the rights were acquired, sanctioned such waste. Especially do the cases of the pumping of water from Clear Lake for the irrigation of 10,000 acres of rice in Yolo County and of the virtual setting aside for the war period of the injunction against the diversion by Lake Land Canal of flood waters of Kings River, constitute a step forward, even if only for the period of the war. It is very doubtful if any substantial damage was done to anyone through the pumping from Clear Lake and it is certain no damage was done by the use of Kings River flood waters. These, however, are only the more striking instances of real conservation of irrigation waters through actual beneficial use that have been brought about through war necessity. The important question now is, when the war emergency has passed, can public sentiment be kept up to the point of holding to the principles found workable in 1918? In our judgment, a way should be found through appropriate legislation to continue in effect the substance of Emergency Decision No. 4278 of the Railroad Commission and Act No. 1732*k* of the 1917 legislature.

Co-operation With Farm Advisors.

The work done under this head has been a prominent feature of our activities during the past two seasons. As already indicated it has been chiefly with the farm advisers of Shasta, San Joaquin, El Dorado, Merced, Placer and Kern counties. In Placer, El Dorado, Merced and Kern counties the taking over of the existing irrigation systems by the landowners, through the organization of irrigation districts, has been the question given attention. Investigations in El Dorado County are stil under way by Professor F. J. Veihmeyer and in Kern County by A. L. Fellows Senior Irrigation Engineer. A report advising the immediate formation of a irrigation district in Merced County with an initial area of 175,000 acres has bee prepared in conjunction with the State Engineer and is now before the irrigation district committee of the Merced County Farm Bureau. In Placer County we are nov co-operating with the Farm Bureau in the preparation of a general field map of th irrigated and irrigable lands under the irrigation system of the Pacific Gas an Electric Company, this map to aid in advising as to the feasibility of forming a irrigation district there.

Other important co-operation with farm bureaus has been as follows:

Shasta County. Advised as to diversion dams for small individual irrigatio systems near Redding and as to use of drainage waters for irrigation in Fall Rive Valley. This work was done by Fred C. Scobey, senior irrigation engineer.

Yolo, Napa, Sonoma and San Joaquin Counties. General reconnaissance of irrigation conditions, advice and assistance to individual irrigators in laying out an preparing land for irrigation, irrigation experiments, irrigation practice, etc.

Monterey County. Investigation of opportunity for forming an irrigation distric in Clark Colony.

Investigations of Use of Water from Kings River.

Incident to the pending organization of the Kings River Conservation District the State Water Commission was called on early in 1918 to measure all diversion from Kings River during 1918. Our office has co-operated in these measurement through furnishing needed automatic water registers. It was obvious, however, tha a thorough study of the use of this water measured by the Water Commissio would be needed properly to interpret the records of diversions, and we hav co-operated with the Water Commission in this by having an agent on the groun throughout the irrigation season. It was at first hoped that considerable dat could be gathered as to the actual use of water in many individual cases. The territory, however, proved so large and the interests on the river so varied that i was soon found impossible to put much time on detail. It was realized that th ultimate irrigation efficiency is not likely to obtain on Kings River for many year but it is obvious that if the water is to be made to perform a fuller duty than a present, and the duty contemplated for the Pine Flat Project, many water economie will have to be inaugurated by the various diverting and distributing agencies alon the river. With this thought in mind, Mr. Harry Barnes, the field agent on th work, endeavored to ascertain where leakages occur and what corrective measures ar necessary to eliminate them. To this end consideration was given to the organization and administration of each company, the cost of water, methods of payment and the general relations of companies and consumers. The general physical condition of canals and ditches of each system was noted, the mileage and acreag involved, and the system of maintenance followed. It was also necessary to ascertai the crops irrigated and the seasonal demands for water, methods of irrigation followe and the reasons therefor, effect and extent of subirrigation, and the general condition as regards drainage. Finally, it was necessary to obtain some understanding of loca water rights, intercompany agreements, and litigation. No plans have been made t publish Mr. Barnes' report of this work, it being intended mainly for an office recor for public agencies interested.

Irrigation of Rice.

Investigations of rice irrigation have continued during the past two years, dut of water studies being in co-operation with the State Water Commission and experiments in irrigation practice being partly in co-operation with the Water Commissio and partly in co-operation with the Bureau of Plant Industry of the Department o Agriculture at their Biggs station. Results of investigations in 1918 are no available at this writing. They have, however, included measurement on 828 acres on four rice farms near Norman and Maxwell in Sacramento Valley, a

PLATE XIII.

Upper figure.—Bear River Canal below Lake Spalding, Placer County. Landowners are considering forming an irrigation district to control the distribution of this irigation water.

Lower figure.—Crocker–Huffman Canal in the foothills of Merced County. The taking over of this system is under contemplation by the landowners around Merced through the formation of an irrigation district.

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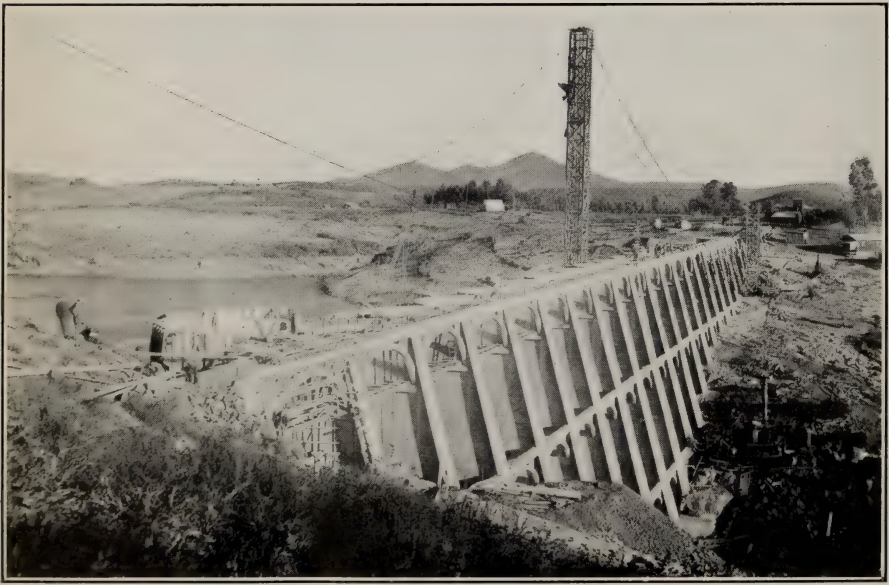
PLATE XIV.



Upper figure.—Typical irrigated truck garden, San Diego County.
Lower figure.—Multiple-arch dam, La Mesa Reservoir, near San Diego.

repetition for the fifth consecutive year of the Biggs experiments in time and method of applying water, and a duplication of these experiments on some of the so-called "goose" lands near Norman. Rice irrigation studies in 1918 have been carried on by Harlowe M. Stafford under the general supervision of Professor S. H. Beckett. Results of measurements of duty of water for rice in 1916 and of the experiments at Biggs in 1914, 1915, and 1916, together with a general description of methods of preparing and irrigation rice land in California, have been published as Bulletin 279 of the California Agricultural Experiment Station, by Ralph D. Robertson.

The area in rice in California in 1917 was approximately 80,000 acres and this increased in 1918 to over 100,000 acres. The measurements of water used show a definite increase in economy, the average depth of 7.25 feet applied on the fields under observation in 1916 having been reduced to an average depth of 5.5 feet on the twenty fields under observation in 1917.

No definite arrangements have yet been made regarding publication of results recorded since 1916, the time of further publications being dependent on the extent to which rice irrigation studies are to be continued beyond 1918.

Duty of Water Investigations, Yuba and Nevada Counties.

During the irrigation season of 1917 a study was made of the use of irrigation water under the system of the Excelsior Water and Mining Company in Yuba and Nevada counties, the expense being borne jointly by our office and the water company and consumers. The occasion for this study was a controversy between company and consumers as to a fair water rate to be charged by the company. A rate higher than had previously been in effect was granted by the Railroad Commission, March 19, 1914. Later a compromise rate of 10 cents per miner's inch-day for the seasons of 1915 and 1916 was allowed by the Commission under stipulation that company and consumers join in the expense of an engineer to make determinations of the water requirements of the section. The work covered ten fields, three in Pleasant Valley, four in Penn Valley, and three near Smartsville, and was done by J. B. Brown, representing this office. These fields were selected with a view to representing the different soil types, crops and topographic situations in the three representative areas. Mr. Brown's report, fully illustrated by maps, was mimeographed and furnished interested parties early in 1918. He found that under present practice a fair general duty is one miner's inch to 3.25 acres, or an average net duty of 2.5 acre-feet per acre, 80 per cent of the irrigated area being in meadow. General recommendations made by Mr. Brown called for substituting a 10-day rotation delivery to all irrigators for the varying rotation period found in effect, for insistence on adherence to the schedule adopted, and for the installation of standard weirs for measuring all deliveries.

A Demonstration Pumping Plant and Pipe Distribution System.

The wide use of underground water supplies for irrigation in California has led to a high type of pumping equipment in certain sections of the state and a distinct advance in practice is noticeable as compared with a decade ago. Unfortunately, however, pumping installations are most frequently made by local dealers in pumping machinery and possible economies are not always looked out for, especially where pumping for irrigation is relatively new. A similar situation exists with reference to underground pipe distribution systems. A demonstration project has been designed and its installation supervised by Milo B. Williams, Senior Irrigation Engineer, on the Herman E. Berg ranch three miles north of Yuba City, the owner furnishing all labor and material and this office all engineering. In addition to indicating a modern pumping installation for the development of underground water supplies and demonstrating the design, manufacture, and installation of an up-to-date concrete pipe distribution system for both orchards and field crops, the project, when fully completed, will include the careful laying out, levelling, and checking of land where necessary, in accordance with a thorough ground survey and good irrigation practice. A water supply of approximately 2000 gallons per minute was obtained from two 12-inch open-bottom wells 84 feet deep. These wells were individually tested and the pumping equipment designed to meet the conditions found, this design calling for the placing of a direct connected horizontal pump 13 feet below ground water level and being made practicable through the building of a water-tight concrete pit midway between the two wells and connected with them through sealed-off tunnels. The concrete pipe for the distribution system was manufactured by the wet-tamp method in accordance with specifications prepared by Mr. Williams, a typical run of 12-inch pipe failing to break under a test of 40 pounds internal pressure, and the 20,000-foot installation developing only three leaks sufficient to show on the surface and require repairing.

Sewage Irrigation.

Studies of sewage irrigation in California, begun by Milo B. Williams, senior irrigation engineer, in 1916, have been continued. Topographic surveys, study of sewage requirements, and design of distributing systems were made by Mr. Williams for each of the cities of Ontario, San Luis Obispo, and Santa Rosa. The first two of these cities have made installations in accordance with the recommendations prepared in this office and are demonstrating the successful distribution and utilization of sewage waters through pipe distribution systems of modern design. A visit to the sewage farms of Ontario or San Luis Obispo is alone needed to show the desirability of better irrigation engineering in the laying out and operation of sewage farms than has heretofore obtained.

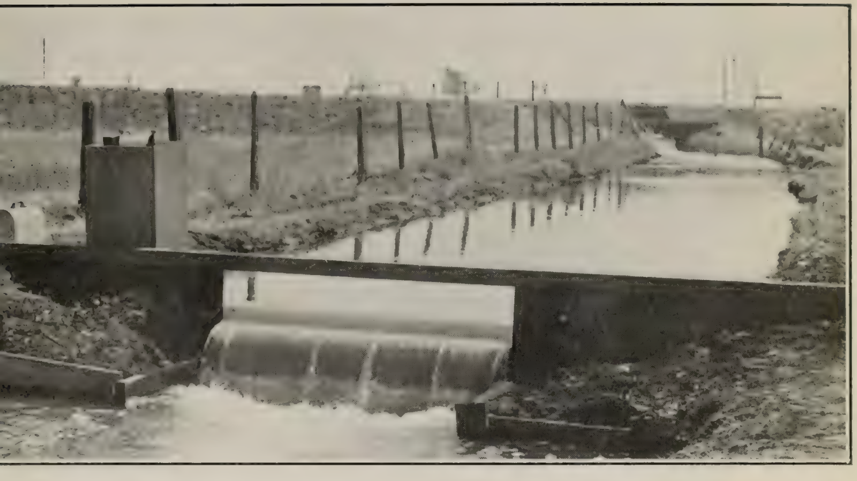
Concrete Pipe Investigations.

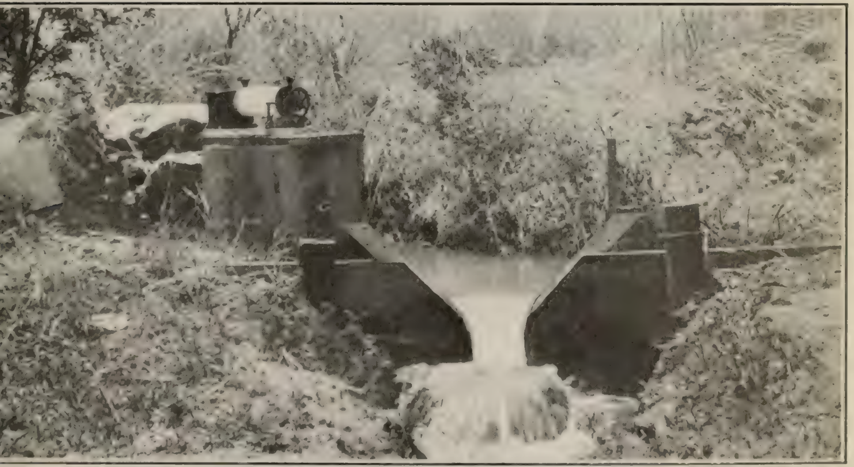
California leads all other states in the use of concrete pipe for irrigation purposes. There are approximately 150 independent manufacturers placing pipe on the market within the state. The demand from engineers, manufacturers, and farmers for data regarding the making and uses of concrete pipe and the lack of such knowledge led this office to start a project in March, 1917, covering a careful field study of the manufacture, classification of materials being used, testing of pipe made by different methods, and a study of concrete pipe design and their uses for irrigation purposes, this work being in charge of Milo B. Williams, senior Irrigation Engineer. The testing required the standardizing of testing methods and field equipment for the study of pipe resistance to internal pressure and other factors, such as imperviousness, which indicate the quality of structure. The project was continued for approximately six months, during which time a series of tests were run on 10-inch and 12-inch pipe. The results brought out a great range of quality and strength in concrete pipe being placed on the market. The manufacturers expressed a willingness to furnish pipe for extensive continuation of the work in order to obtain data for the purpose of standardization of the industry, which, in many instances, has suffered from serious failure of pipe construction. This project is to be continued at the conclusion of the war and the investigational work carried into the laboratory.

Co-operation with State Land Settlement Board.

Our force has been called on from time to time for investigation of tracts under consideration for purchase by the State Land Settlement Board. Since the purchase by the board of the Durham Colony in Butte County, Milo B. Williams, senior irrigation engineer, has had personal charge of irrigation development on the tract and also of the construction of an adequate drainage system to remove surplus storm waters. In connection with development of the irrigation system, the financial co-operation of all ditch owners along Butte Creek was obtained in the construction of a permanent community diversion dam across Butte Creek. Other engineering work has consisted of the subdivision of the tract into farms and a topographical survey of the 4500 acres of irrigable land to a five-tenths foot contour interval. The contour survey is being used as a basis for irrigation and drainage design and an individual contour map is furnished each settler for use in the preparation of his land for water application. A contour key map is being made covering all subdivisions and the entire water system. All structures are being installed in concrete and concrete pipes will be used extensively for irrigation and drainage gates, checks,

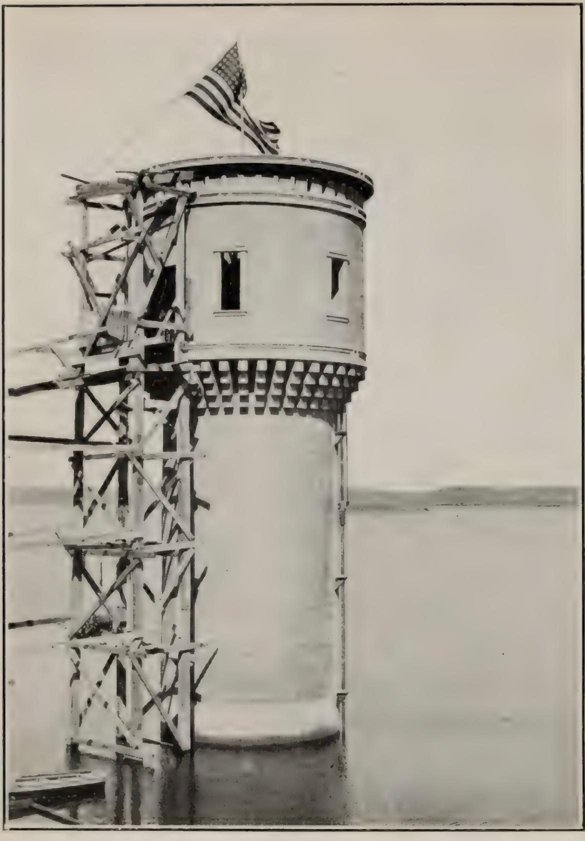
PLATE XV.

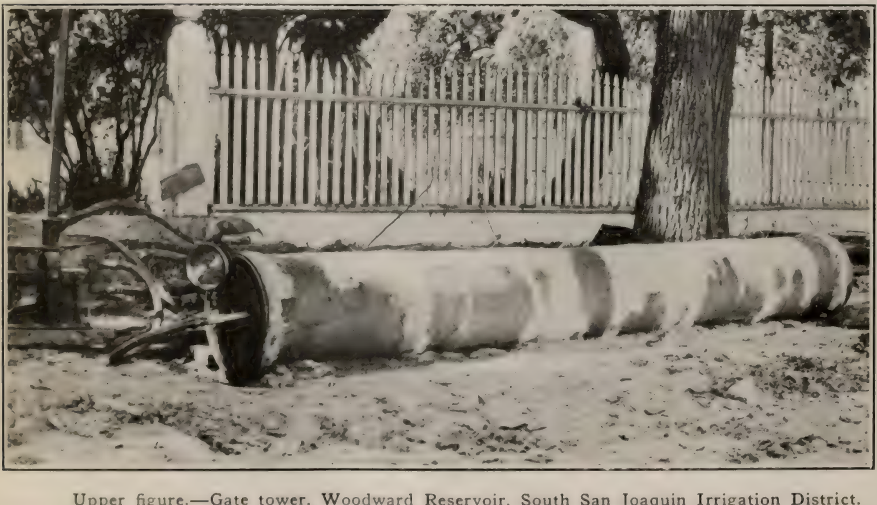




Upper figure.—Rectangular measuring weir and automatic register, rice duty of water investigations, Yolo County.

Lower figure.—Measuring small streams with V-notch weir and automatic register, Yuba–Nevada Counties duty of water investigations.





Upper figure.—Gate tower, Woodward Reservoir, South San Joaquin Irrigation District.
Lower figure.—"Sweating" string of 12-inch concrete pipe under five pounds pressure per square inch. This pipe, however, failed to break under 40 pounds pressure. Concrete pipe investigations.

verts, etc. Pipe ranging in size from 10 inches to 36 inches in diameter is being le on the colony under specifications issued by this office.

Miscellaneous Investigations.

In addition to the emergency investigations reported under war activities, numerous cellaneous studies have been made from time to time and individual advice and istance given in connection with installation of individual irrigation pumping nts, design of distribution systems, surveys of individual or community reservoir s, etc. One of the more important of the miscellaneous investigations has been by Fred C. Scobey, senior irrigation engineer, dealing with supplemental irriga- i systems for range stockmen to tide over periods of extreme drought like that erienced in 1918.

Special investigations made at the request of the State Engineer included investiga- is of proper duty of water and irrigability of lands in the proposed extension of diff Irrigation District along the coastal plain of San Diego County; investigation water supply and irrigability of numerous suggested sites for the Pacific Colony, horized by the last legislature; investigation of proposed irrigation reservoir site irrigability of adjacent lands in Placer and Nevada counties.

Special Investigations in Southern California.

Mr. C. E. Tait, senior irrigation engineer, in charge of special investigations in thern California, has submitted the following summary of work done under his nediate direction during the past biennium:

Special irrigation investigations in southern California have pertained mainly to major subjects, the investigation of silt in Colorado River and the Imperial ley canal system, and the utilization of Mojave River for irrigation. Much time, ever, has been devoted to consultation and in preparing brief statements and orts, some of which required investigations in the field.

Silt Problem in Imperial Valley. The investigation of the silt problem in Imperial ley was undertaken in the spring of 1917 and the field work will be completed by uary 1, 1919. The purpose of this work has been to obtain data which should be ful in the construction, operation, and maintenance of irrigation works for silt- n waters. Although most of the work has been done in Imperial Valley, the estigation has not been confined altogether to that section and tests are being le in Yuma and Palo Verde valleys as well as at different points on Colorado er. The silt problems are the most important and the most difficult confronting water users of Imperial Valley. Every problem of any consequence as to the ire of the irrigation system relates to the ability to properly handle the silt ried by Colorado River and deposited in the canals. The proper construction and gn of works, the control of the river, the establishment of security for bonds, the ration and maintenance of the canal system, and the maintenance of proper soil ditions for agricultural production all depend on success in handling silt. Other al systems in the southwest have similar problems and the results obtained in this k should have general application.

This investigation is in co-operation with Imperial Irrigation District and the ense has been about equally divided between the district on the one side and operative Irrigation Investigations on the other side. The work has been done tly according to an approved outline which provides for the interchange of all a now being obtained as well as data obtained by the parties to the co-operation or to the present investigation. On the part of the district the work has been in rge of J. E. Peck of the engineering staff. The district appropriated $4755 to er expenses and equip a laboratory at Calexico. In addition to this, the district furnished an automobile and paid all running expenses for the use of its engineer the agents of this division engaged in the work. This division made some addi- s to the laboratory equipment and furnished the greater part of the field apparatus 1 as water samplers, current meters and surveying instruments. The members of force engaged on the work have been H. F. Blaney, H. M. Lukens, F. J. hmeyer and F. D. Bowlus.

Employees of the irrigation district assisted in the work by taking water samples at various points on the main canal. Arrangements were also made with the mutual water companies of Imperial Valley for the taking of daily samples on the distributing canals by their zanjeros.

The U. S. Reclamation Service has made available for use in this investigation the results of tests on the percentage of silt in Colorado River at Yuma conducted throughout a period of nine years. These determinations are useful for comparison and for showing the variation from season to season.

The most of the work has been under two main divisions of the subject, one being to determine how the silt and sand are being distributed throughout the Imperial canal system, and the other to determine the carrying capacity of silt and sand for different velocities of current.

In order to determine the distribution of the silt and sand throughout the canal system, samples were taken daily at 18 different stations on the canals for one year and the percentage of silt was determined on the weight basis from these samples by filtering and weighing. This part of the work is completed and the results are tabulated.

In connection with the studies of the carrying capacity of different velocities, many tests are being made on canals of different sizes, grades, and mean velocities, and at different seasons giving different percentages of silt in the water. These tests show the effect of depth and velocity on the transportation of silt and sand and they take account of size of particle and specific gravity. The samples are taken with a sampler especially devised for taking samples at any depth in the canal. This part of the work will be continued until the first of the year.

In addition to these main divisions of the work, samples have been taken from Colorado River at Topock, near Needles, twice monthly for one year. These samples are taken at different depths and in such manner that the results are comparable to those obtained by the Reclamation Service at Yuma.

Mojave River Investigations. The investigation of conditions on Mojave River was begun in January, 1917. About that time the Board of Supervisors of San Bernardino County was called upon to act on petitions of landowners and entrymen in Victor Valley for the formation of two irrigation districts, and, desiring more information on the conditions, our office was requested to join the State Department of Engineering and the county in a joint investigation. For this purpose the Mojave River Commission, consisting of W. F. McClure, State Engineer; J. A. Sourwine, County Surveyor and Engineer for San Bernardino County, and the writer, was appointed and $3000 was set aside by the county to be expended through the county's engineer in the joint investigation. About $2000 of this amount was used. The greater part of the field work was done during the first half of 1917 and a preliminary report was made to the Board of Supervisors in August, 1917. Since that time some additional field work has been done and a more complete and final report covering the entire investigation is now being printed as Bulletin No. 5 of the State Engineering Department. F. J. Veihmeyer and Fred D. Bowlus assisted materially in the field work. C. G. Haskell, who was conducting an investigation on wells throughout the West, co-operated with the commission on the work in Victor Valley and the data secured by Mr. Haskell was made available for the report on Mojave River.

CONSERVATION OF FLOOD WATERS IN COACHELLA VALLEY.

The last biennial report included a preliminary report prepared by this office on the Conservation and Control of Flood Waters in Coachella Valley (Bulletin 4, California State Department of Engineering). This report made recommendations for the spreading of the flood waters of Whitewater River over the debris fan below the canyon to benefit the underground water supply in Coachella Valley, and for the examination of two different routes for a flood water channel through the valley from Point Happy to Salton Sea.

One of these routes, that on the northeast side of the valley and known as Thousand Palms Canyon Wash, was believed from the data then at hand to be the better of the two possible routes, but the data did not justify final recommendations.

Other agencies who were advising the Coachella Valley Storm Water District, also the district's engineer, recommended the other route, that on the southwest side of the valley, and for a time there was much difference of opinion among the property owners as to the proper plan of works.

To bring about harmonious action, the question was referred to a board of three engineers having no previous connection with the matter. These engineers, after making preliminary surveys, made recommendations which agree with those of this office, both as to the spreading of water as a conservation measure, and as to the proper route for the flood water channel. They recommended one important additional feature to the proposed works in a regulating reservoir for the flood water, to be formed by the construction of a dam across the Whitewater channel at Point Happy.

The survey shows that a dam 40 feet high would impound 8400 acre-feet. With such a regulator, the flood water channel through the valley need have a capacity of only 3000 second-feet, instead of about 10,000 second-feet, that would otherwise be required.

The estimated cost of all the works is $300,000, of which amount $68,382 is for the dam and reservoir, $199,244 is for the flood water channel, $10,000 is for spreading flood waters, and the remainder is for contingencies. The district has voted a bond issue of $300,000 to carry out these plans. In accordance with the recommendations in Bulletin No. 4 the district applied to the government for the reservation of some of the public land along Whitewater Wash for use in water conservation work and such reservation was made.

Use of Water for Alfalfa in Imperial Valley. Field studies of the use of water for alfalfa in Imperial Valley by Frank J. Veihmeyer and the writer, begun in 1914, were completed in November, 1917, and a report is now being prepared. Six representative alfalfa fields were under observation and measurements were made on eight tracts on these fields. The least amount of water, a depth of 3.85 feet, was used on clay soil, while the dune sand soil received a depth of 6.53 feet. While the use of water is determined primarily by the soil type, the measurements show that the care used in preparation of the land for irrigation, the size of the "lands" or checks, and care in applying water greatly influence the annual requirements. It was found that the amount of silt carried onto the land also materially affected the amount of water required. In addition to the measurements of amounts of water applied the distribution of the moisture in the soil was determined and also measurements of the deposition of the silt carried in by irrigation water on different portions of the fields were made.

Miscellaneous Investigations. In addition to these two major subjects, brief reports were prepared as follows:

In July, 1918, a report was made at the request of the State Engineer on the water supply and water rights in San Jose Creek Valley, where the Pacific Colony had under consideration a site for the institution. In September following a supplemental report was made giving discharges and other data on pumping plants along the San Jose Creek as desired by the State Engineer. The field work in this connection was done by Mr. Bowlus.

In September, 1917, a report was made to the Federal Land Bank at Berkeley on the water supplies for the irrigation of lands of 16 applicants for loans in the southern part of Antelope Valley. In August, 1918, a general report on the underground waters of Antelope Valley, including all portions of the basin, was made to the Federal Land Bank.

In August, 1918, together with the State Engineer, a report was made on the power and irrigation project of the Volcan Land and Water Company in San Diego County, this being understood to be for the Capital Issues Committee.

In August, 1918, an opinion was prepared on the effect of waste water from flowing wells on the water supply in Orange County. This was for the County Farm Adviser and the Council of Defense.

In September, 1918, together with Mr. Bowlus, a report was prepared for the Capital Issues Committee on the power and irrigation project of the Sespe Light and Power Company in Ventura County.

In October, 1918, a report was prepared for the Capital Issues Committee on Imperial Water Company No. 3.

At the request of the board of directors of the Santa Ana Irrigation Company of Orange County, a preliminary examination has been made to recommend the type for headworks for the company's canal on Santa Ana River. As soon as time will permit, it is the intention to make a more thorough and broader examination as the matter involves a number of other considerations, including the possibility of a joint dam and headworks with the Anaheim Union Water Company and the protection from floods of the Orange County highway and railroad tracks which follow the banks of the river.

Irrigation District Legislation.

Probably no law on the statute books is more amended than the California Irrigation District Act. Members of our force have continued to give attention to the improvement of this law and in this connection have, when called on, worked with the California Irrigation Districts Association and with the irrigation committees of the legislature. There is obviously need for general revision of the California Irrigation District Act, but it has been our conclusion that this general revision should not be undertaken until the act becomes more fully worked out. This is because each succeeding legislature has before it numerous changes of more or less detail to meet particular situations that arise, and a general revision now would not be permanent. There has been a very noticeable tendency among some of the newer irrigation districts to ask for amendments that would make the formation and financing of district easier. Remembering the earlier history of California irrigation districts and the subsequent history in other western states, it has seemed prudent to members of our force in touch with the situation to be exceedingly cautious in moving in that direction. The older California irrigation districts have established themselves as sound financial investments and any reaction might be very injurious to worthy and sound district enterprises yet to be organized. It is our belief that our safe course is to impose suitable restrictions on doubtful projects but leave the way open and furnish every encouragement to enterprises economically and physically feasible.

In our judgment, the California Irrigation District Act should not permit the organization of irrigation districts where a majority of the substantial interests involved are unfavorable. Several districts of this type have been organized in California during the past few years, and although no bonds have been authorized by the Irrigation District Bond Commission, sufficient expenditures in some cases have been made and assessments levied therefor to create a considerable burden on some of the landowners. This could have been prevented if the Department of Engineering had been given authority to pass on preliminary financing and on the nature and extent of preliminary engineering investigations after organization, or, better still, if the Department of Engineering could have been provided with funds and itself have made these preliminary investigations, with power to veto the organization if found not to be practicable or feasible at this time.

It is believed that the time is coming, if it is not already here, when the crops being chiefly grown in irrigation districts must affect the maturity of the bonds to be issued. With this fact in mind, it is suggested that section 30*a* of the California irrigation district act be amended by adding proper maturity of the bonds to be voted to the matters on which the irrigation district bond commission shall state generally its conclusions when passing on proposed works.

In our judgment, one of the most progressive steps open in matters of irrigation district organization is the making of preliminary investigations of proposed districts at the expense of the state. The time to guide these enterprises, and to co-ordinate and consolidate the different points of view inevitably present, is when they are starting, and the interest of the state in not only holding back unwise ventures but above all in fostering desirable projects is paramount to all other interests. Worthy and feasible projects are held back through lack of state aid and advice at the early stages when most needed.

Much thought has been given in California and in other western states to the matter of state control of irrigation districts, and a larger measure of such control has been granted in California than in any of the other states. A change in sentiment n this matter is plainly noticeable. Where a few years ago some of the older districts nd some of the prominent engineers dealing with irrigation districts were opposed to ny state control whatever, a well-defined desire for such control now exists. In other vords, the state is coming to be recognized as the best friend the districts have, and ound thought has come to realize that without a substantial measure of state control, he beneficial participation of the state through the Department of Engineering or the ollege of Agriculture or the Irrigation District Bond Commission could not be sup-lied. In these days of active irrigation district organization in California, we believe o mistake can possibly be made by giving to the state an increasing responsibility and n increasing measure of engineering and financial control. Merely a limited measure f state control leads the public to a presumption of state approval, which is clearly nuch more undesirable than no state supervision whatever.

Land Settlement Problems; Federal and State Co-operation.

Since land settlement became a problem in California some five or six years ago, ur force has been interested in and has given considerable attention to the question. o-operation with the State Land Settlement Board has already been referred to. he broad land settlement program recently inaugurated by Secretary of the Interior ranklin K. Lane suggests future activities in California in which the Co-operative rrigation Investigations are bound to be interested. The purchase and settlement n the state of farm lands in colony groups, as already begun by the State Land Settlement Board at its initial colony at Durham, is indicative of a larger program long similar lines quite sure to follow. The question arises, however, are there not vorthy and desirable irrigation and reclamation projects in California where the ettlement already accomplished makes the present state program, even if extended hrough the working out of Secretary Lane's program, insufficient to meet all of our eeds? It is our belief that there are such projects in California and that under dequate limits on speculation at the expense of the ultimate purchaser of the lands, he use of the credit of both the state and the federal governments is both needed nd justified in their financing. Past reclamation experience in this country is suffi-ient, even if it were needed, to prove that where the public credit is used in irriga-ion and land settlement projects, the ultimate settler must be protected against xcessive land prices. In our judgment, the use of both state and federal credit, nder proper restrictions and adequate control of construction and management, vould be justified for such enterprises as Imperial Irrigation District, the pending onservation district at Fresno, the proposed irrigation districts on San Joaquin and Kern rivers, and the proposed Iron Canyon project in Sacramento Valley. Obviously, owever, these are all too big and all already too far developed, either as dry land ommunities or as operating irrigation systems, to make possible the settlement of all f the land by the state or the nation. Furthermore, the settlement of such enter-rises can only be accomplished after many years of relatively slow development. This makes the saving to the settler merely in the lower interest rate public credit vould give a matter of great moment. Above all, however, the use of state credit vould enable these larger projects to develop, even if only slowly, whereas without uch state credit the construction of the storage works needed for full utilization will e difficult to finance. The problem is to develop a policy that will make such aid racticable and at the same time carry along with it a safe land settlement plan dapted to projects of varied ownership and interest and of too great size to form a ingle settlement group. This in itself will require adherence to the essential features f the land settlement policy being developed in California at the state colony at Durham and in a larger way being outlined under the leadership of Secretary Lane. ertainly in whatever plan is worked out a considerable measure of state participation s inevitable if the best interests of the state are to be realized. Certainly, also, the naking of real opportunities on the land, where, with small initial payments, qualified ettlers can earn the cost of their farms and their living out of the soil, will be a overning essential of the program. To follow any other course would be only to dis-regard completely the lessons past irrigation and reclamation experience has furnished.

CONFLICT OF INTERESTS.

Irrigation. Under the head of "River Work," mention was made of investigations that were made by the Department of Engineering to ascertain the quantity of water taken from the Sacramento River for irrigation. Attention is invited to the table accompanying that discussion, which gives a list of all pumping plants along the river between Tehama and Knights Landing, together with much detail concerning each plant.

From the data furnished by the table, it is deduced that the total pumping capacity of all of the plants is about 2600 cubic feet per second. The time of operation varied from a few hours for some plants to five or six months for others. During the summer of 1918, the quantity of water pumped by all of the plants aggregated 529,852 acre-feet, which was 58 per cent more than was pumped from the river in 1917. The increase was due almost wholly to the increase in area of lands devoted to rice culture.

During the time the greatest quantity of water was being withdrawn the flow in the river was measured at Colusa and found to be 2185 second-feet.

The acreage to which the 529,852 acre-feet of water were applied is not known. There are approximately 3,500,000 acres of land in the Sacramento Valley, plains and foothills, of which more than 2,500,000 acres can be considered irrigable.* At the time the above figures were published in 1912, it was estimated that about 169,000 acres in the valley and adjacent Sierra foothills were being irrigated. A large increase in the irrigated area has been made since those figures were compiled, but information as to the amount of land now under irrigation is not at hand. It is not believed, however, that more than 10 per cent of the land susceptible of irrigation is being supplied.

Gaging stations are maintained on the river and each of its principal tributaries where they enter the valley, and the records show that the average quantity of water flowing into the valley is about 27,000,000 acre-feet a year. The quantity, if it could all be applied, would cover the irrigable lands to a depth of more than ten feet, but unfortunately most of it comes in flood flows and must always go to waste, leaving but a trickling stream, comparatively, to supply the lands at the time they most need it.

It is quite apparent, then, that if the irrigated area shall be extended as in the past, unless the summer flow can be augmented in some way, only a very short time will elapse until the river flow will be entirely exhausted, and that with only a small part of the valley irrigated.

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*Report of Conservation Commission, 1912.

Navigation. The Sacramento River is recognized by the United States government as being navigable to Red Bluff, 254 miles above its mouth, at certain seasons of the year, and to Chico Landing, 202 miles, at all seasons.

The control of the river for navigation is exercised by the War Department. For many years the government has maintained a working force on the river, whose efforts are directed toward maintaining a navigable depth of seven feet in the lower river, four feet between Sacramento City and Colusa, and three feet to Chico Landing.

The appropriations by the United States for maintaining navigable conditions on the river since 1875 have amounted to about $1,500,000, while the state has expended more than a million dollars for the same purpose.

As a result of the efforts of nation and state to provide navigable depths of water, steamers ply up and down the river regularly throughout the year. There are drawbridges across the river above Sacramento at Knights Landing, Meridian and Colusa, where records are kept of the number of times the draws are opened for the passage of vessels.

For the fiscal year ending December 31, 1916, the number of craft registered as passing these bridges was as follows:*

	Knights Landing	Meridian	Colusa
Steamboats	645	466	518
Gasoline boats	373	37	34
Barges	174	214	212
Dredges	13	8	4
Pile drivers	3	1	2
House boats	21		
Yachts		2	
Sailing vessels		2	

The above figures do not include vessels passing which did not require the draws to be opened.

Commerce on the Sacramento River increased from 477,292 tons in 1912 to 875,780 tons in 1916, nearly doubling in tonnage in five years. Above the city of Sacramento boats carried 146,720 tons in 1915 and 168,157 tons in 1916, an increase of 14½ per cent in one year. The figures for later years are not yet published, but undoubtedly they show a continuing increase of water-borne traffic.

At the time the river reached its lowest stage last summer, when only 2185 second-feet were registered, which condition was brought about by the withdrawal of water for irrigation, no complaints were made on that account by the navigation interests operating on the river, but the government was compelled to dredge channels across bars which had formed below the confluence of the American River, both above and below the city of Sacramento.

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*Annual report, Chief of Engineers, U. S. Army, 1917.

Notwithstanding that complaints have not yet been made against the irrigators, it is quite evident that if withdrawals of water from the river are to be increased every year, the time will soon come when there will not be sufficient water for the needs or navigation.

The Impending Conflict. The Department of Engineering has long seen the approaching conflict between the interests of agricultural production requiring water for irrigation, and the interests of navigation which must have the same water, or a part of it, upon which to transport the commerce of the valley.

Water is required to produce crops and water is useful to transport those crops to market at a figure that will leave a profit to the producer. The rates for transportation on the river are generally lower than by rail, unless in instances where the railroad charges have been reduced to meet the water rates.

The department has taken occasion to suggest that close study should be made with a view of determining just how irrigation can be developed to the fullest extent without destroying or impairing the great asset the valley possesses in its cheap means of transportation.

Department engineers have devoted considerable study to the subject, but as their time is well occupied with the routine of their respective duties, none have had the time to give it the intensive and extensive study the subject requires.

It is known that opportunities exist for storage of surplus waters by construction of reservoirs in the mountains. Some data has been accumulated from time to time, and it is believed that sites not yet examined can be found.

There is some doubt that enough storage capacity can be found which will enable the entire valley to be irrigated, but certainly if all available sites were utilized, it would enable a very great extension of irrigation to be made without impairing other interests.

In this connection, attention is invited to the Report on Pit River Basin, by the U. S. Reclamation Service in co-operation with the Department of Engineering, 1915, and the report on the Iron Canyon Project by the Reclamation Service, together with a report of a board of review, reviewing said report, 1914. The review referred to is published herewith as Appendix "B."

The survey of Pit River Basin discovered a site where a 90-foot dam would store 650,000 acre-feet of water. The Iron Canyon Project report shows the possibility of storing 650,000 acre-feet.

The consummation of both or of either project would go a long way toward ameliorating the conditions threatening.

But the construction of great reservoirs and the accessory works to utilize them is enormously expensive and can not be undertaken by private or small community enterprises.

It seems the time has arrived when thorough investigations should be made by the state to ascertain what assets it possesses capable of conserving its waters so necessary for the important industries depending upon them.

It is urged that the Department of Engineering, by reason of its organization and equipment, is the natural agency through which the required information should be obtained. Attention is invited, too, to the fact that a large part of the normal force of engineers employed by the department—experts in the matters named above—are away with the army. Soon after peace is secured, they will be returning, and their services will be available if funds and authority are given for their employment in this work.

Unless well directed effort shall be made, it is greatly feared that the conflict of interests above set forth will reach a point where loss and irreparable injury will result to all.

These matters are earnestly commended for consideration by the executive and legislative branches of the state government.

IRRIGATION DISTRICTS.

Following the enactment of the so-called Wright Act, within eight years 49 irrigation districts were created. Few or none had been carefully considered before being organized. Some had but little if any water available, and no knowledge of the requirements of irrigation or the cost of providing works.

As a consequence of the unfavorable conditions attending their birth, few reached adolescence. Indeed, only nine of the entire number are in operation today. Some of these, after many and long struggles, succeeded in effecting compromises with their creditors at figures ranging from 28 to 75 cents on the dollar of indebtedness, refunded their bonds, have secured their water, built the works and became prosperous.

One, Walnut District, never incurred debt and has had no trouble. Others have maintained existence but in a somnolent condition, and have not yet awakened. One, Happy Valley, issued no bonds, acquired no property, and was considered dead, but two years ago it was revived by an act of the legislature legalizing its organization, since which it has arranged to purchase a system, enlarge it to the district's needs, and has voted to issue $615,000 in bonds for its purposes and $280,000 of the bonds have been sold.

Bulletin No. 2 of this department was compiled by Mr. Frank Adams, Irrigation Manager, U. S. Department of Agriculture, and was published two years ago. It gives such a complete history of the rise and fall of the irrigation district movement that it is unnecessary to dwell upon it further here.

In 1897 the act was supplanted by the Bridgeford Act, under which, with its various amendments, the reorganization of the old districts was effected and under whose provision all recently organized districts have been formed.

In 1911 an act was passed providing that when bonds of a district were certified by the State Controller, they should be available for all the purposes that other municipal bonds are.

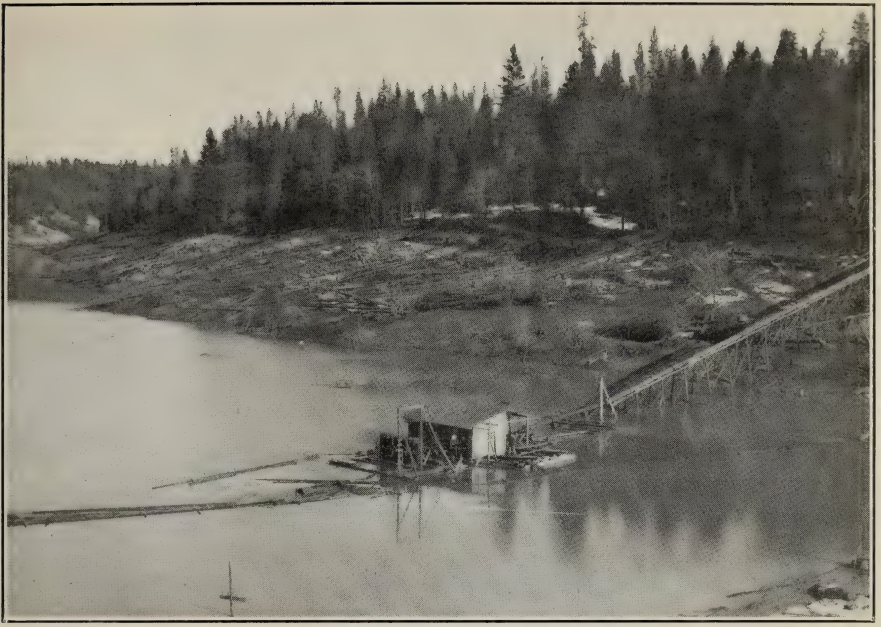
To obtain the certificate named the entire project has to be approved by the Superintendent of Banks, Attorney General and State Engineer. For convenience this body is called the Bond Commission. Since the Bond Commission was created, it has investigated the bond issues of a number of districts, most of which have been approved and the bonds certified.

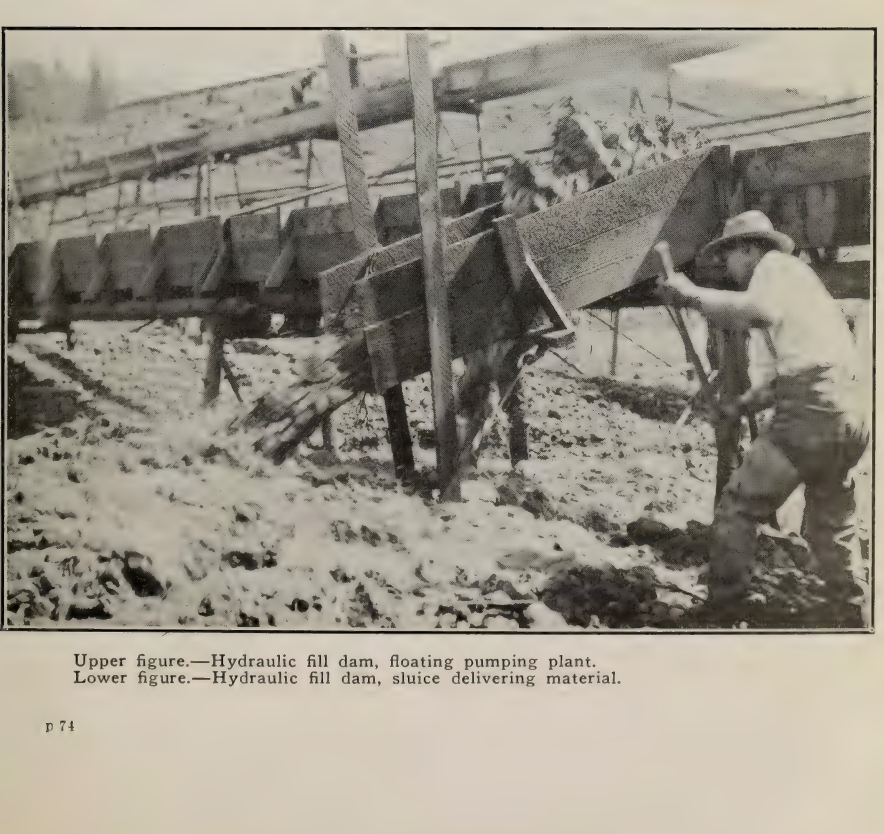
The effect of the certification of irrigation district bonds has been that where, before this law was enacted, they were hardly salable at 75 to 80 per cent of par, the same bonds are now quoted as high as 108 and new issues frequently bring 97 or more at the first offering.

Since 1913 the law has required that the State Engineer shall investigate the project of all proposed irrigation districts. It also provides that in case the report shall be opposed to the formation of the district, if a second petition be presented signed by three-fourths of the property owners, the district shall be formed, notwithstanding the adverse report. Furthermore, if for any reason the State Engineer fails to file a report within the time specified, formerly one month but now ninety days, the district could be formed without the report.

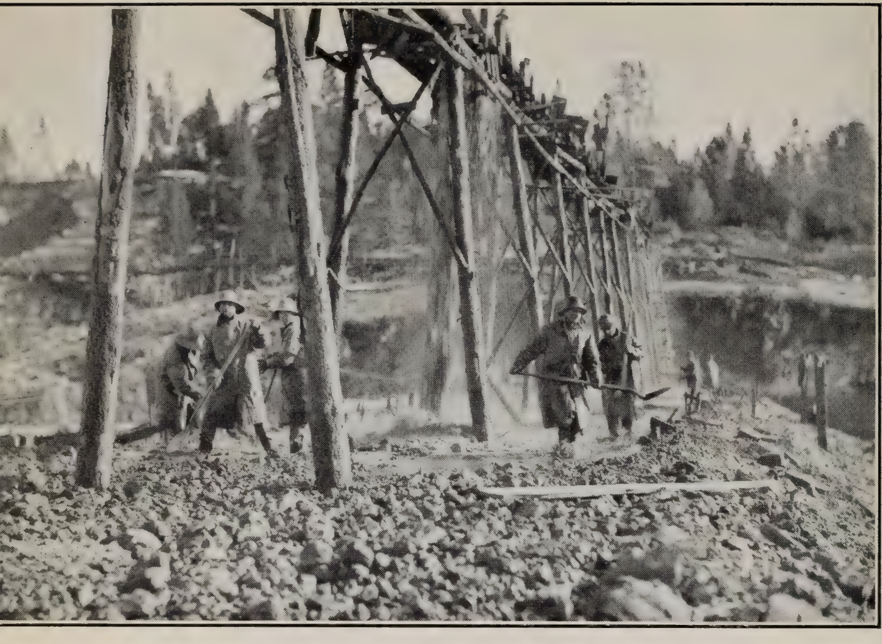
Since this law became effective 35 examinations have been made. One petition was withdrawn upon recommendation of this office, two districts failed of election though favorably reported. Three petitions were disallowed upon adverse report, another was allowed though reported adversely. Two of the petitions disallowed were followed with petitions of three-fourths of the landowners and were organized despite the adverse reports. One was organized without a report, it being impossible to make a physical examination of the project in the time allowed.

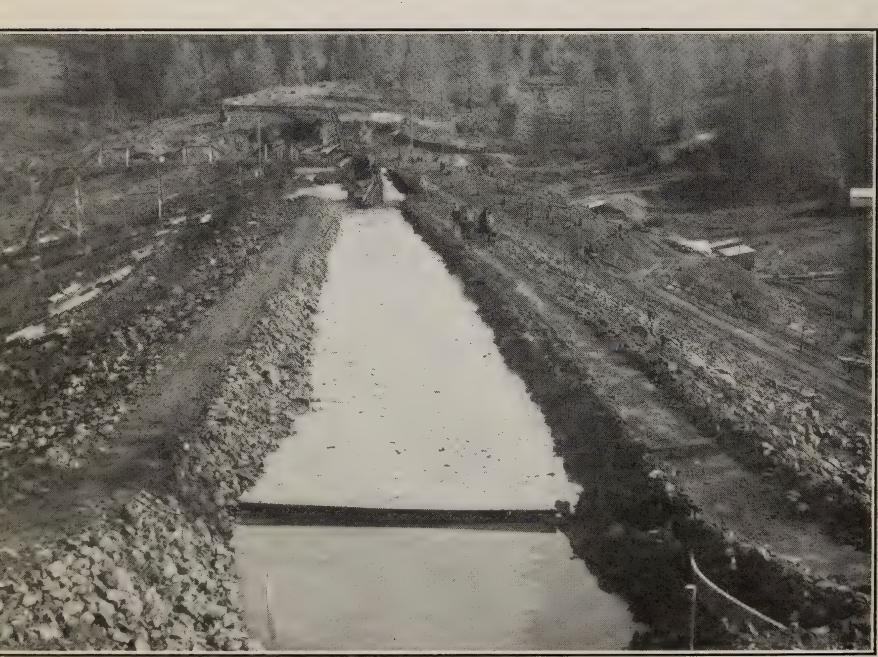
In the case of the two petitions which prevailed against the adverse report, both of which are in the Mojave River drainage, the combined area was practically 100,000 acres. The available supply was manifestly insufficient to serve so much land and upon the recommendation





Upper figure.—Hydraulic fill dam, floating pumping plant.
Lower figure.—Hydraulic fill dam, sluice delivering material.





Upper figure.—Hydraulic fill dam, distributing material.
Lower figure.—Hydraulic fill dam, settling the puddle core.

of this office a commission was created to investigate the whole matter and report just what might be effected in the use of the waters of Mojave River.

The report of the commission is published herewith as Appendix C, and will be issued as Bulletin No. 5 of this office.

Preparations are being made to organize several districts, some of which will be very large.

Since the act creating the Bond Commission became effective, this office has investigated for that commission 17 bond projects, for which the commission ''validated'' bonds aggregating $22,847,321. Some of the bond issues investigated were made before the act creating the commission was passed.

Some old bond issues still outstanding have never been submitted to the commission for validation. Several recent issues are now under investigation, but findings have not yet been issued.

Several of the districts organized in recent years are meritorious enterprises, but under present conditions have little hope of reaching the goal for which they were formed. The soil is fertile when watered, but in its arid condition is of very little value. The water for their development is available, but requires expensive works to utilize it. Without values to offer as security, bonds of such a district would not be salable excepting at ruinous rates of discount, and the Bond Commission is unable to see its way to authorize the issue of bonds, and unless governmental assistance can be given them, these districts must remain undeveloped.

It has been proposed that the state enter upon a colonization scheme to provide homes for returning soldiers. It is suggested that these districts might offer an opportunity for such exploitation by the state, since every landowner would gladly surrender a portion of his holdings at a nominal price for the sake of water to irrigate the remainder.

The following table gives a list of all irrigation districts now operating, with data concerning them:

Irrigation Districts in Operation November 1, 1918.

No.	Name of district	County	Year organized	Area, acres	Bonds voted	Address of secretary
1	Alpaugh	Tulare	1914	7,576	$280,000	Alpaugh
2	Alta	Tulare-Fresno	1888	130,000	543,000	Dinuba
3	Anderson-Cottonwood	Shasta	1914	32,500	1,055,000	Anderson
4	Baxter Creek	Lassen	1916	11,000		Lassen
5	Big Rock Creek[1]	Los Angeles	1890	30,000	253,000	Yermo
6	Blackrock	Inyo	1915	1,210		Big Pine
7	Browns Valley[2]	Yuba	1888	44,328	140,000	Browns Valley
8	Cardiff	San Diego	1916	700		Cardiff by the Sea
9	Carmichael	Sacramento	1915	3,113	90,000	R.F.D. 3, Sacramento
10	Fairoaks	Sacramento	1917	4,000	200,000	Fairoaks
11	Happy Valley[3]	Tehama	1891	18,300	615,000	Olinda
12	Honey Lake Valley	Lassen	1916	33,150		Amadee
13	Imperial	Imperial	1911	576,600	6,000,000	El Centro
14	Jacinto	Glenn	1918	19,660		Jacinto
15	La Mesa, Lemon Grove and Spring Valley[4]	San Diego	1913	14,794	1,232,500	La Mesa
16	Lindsay-Strathmore	Tulare	1915	15,775	1,400,000	Lindsay
17	Little Rock Creek	Los Angeles	1892	3,000	60,000	Little Rock
18	Long Valley Creek	Lassen	1916	34,000		Doyle
19	Maxwell	Colusa	1918	8,000	270,000	Colusa
20	Modesto	Modesto	1887	81,183	2,215,021	Modesto
21	Mojave River	San Bernardino	1917	27,665		Victorville
22	Newport Heights	Riverside	1918	1,503		Santa Ana
23	Newport Mesa	Riverside	1918	670		Santa Ana
24	Oakdale	Stanislaus-San Joaquin	1909	74,146	2,399,500	Oakdale
25	Palmdale	Los Angeles	1918	4,000		Palmdale
26	Paradise	Butte	1916	11,200	350,000	Paradise
27	Princeton-Codora-Glenn	Glenn-Colusa	1917	18.200		Willows
28	Provident	Colusa-Glenn	1918	20,756		Willows
29	Redrock Creek	Lassen	1918	3,700		Ravendale
30	San Ysidro	San Diego	1911	485	25,000	San Ysidro
31	Scott Valley	Siskiyou	1917	5,540		Fort Scott
32	Southern Lassen	Lassen	1915	21,500		Doyle
33	South San Joaquin	San Joaquin	1909	71,050	3,835,000	Manteca
34	Stratford	Kings	1915	9,200		Stratford
35	Surprise Valley	Modoc	1918	17,500		Fort Bidwell
36	Terra Bella	Tulare	1915	12,000	1,000,000	Terra Bella
37	Tulare[5]	Tulare	1889	39,360	500,000	Tulare
38	Turlock	Stanislaus-Merced	1887	175,566	2,572,800	Turlock
39	Tranquillity	Fresno	1917	11,300		Tranquillity
40	Victor Valley	San Bernardino	1917	71,517		
41	Walnut[6]	Los Angeles	1893	869¾		Walnut
42	Waterford	Stanislaus	1914	14,434	465,000	Waterford
43	Webster	Madera	1915	15,000		
44	Westside	San Joaquin	1915	11,700	410,000	Tracy
	Total acreage			1,793,881		
	Total bonded indebtedness[7]				$25,910,821	

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[1] Big Rock Creek District was dormant for many years; revived in 1914.

[2] Browns Valley District paid off its bonds at 30 cents on the dollar.

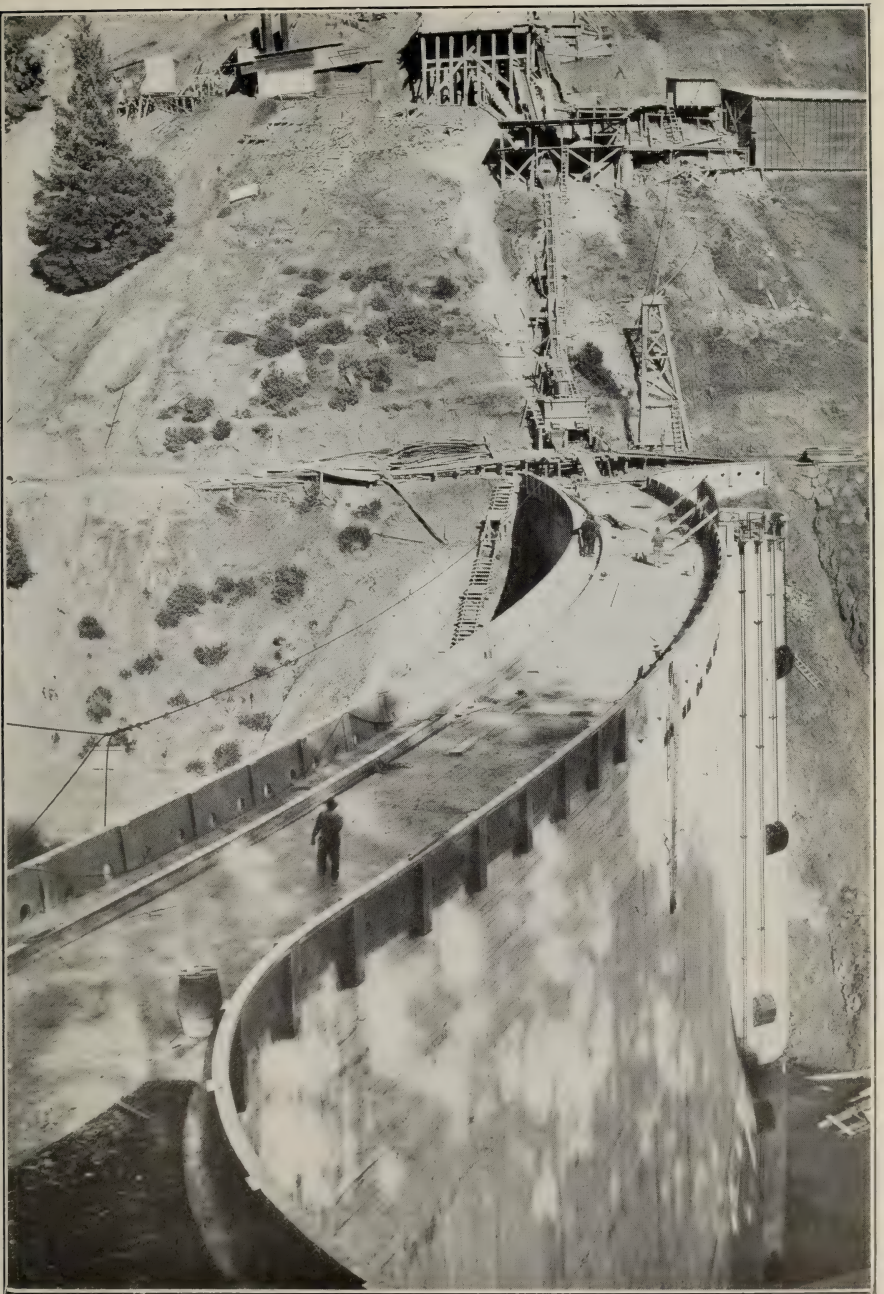
[3] Happy Valley District revived in 1917. Only $280,000 of its bonds, required for present needs, have been validated.

[4] This district's bonds have never been validated.

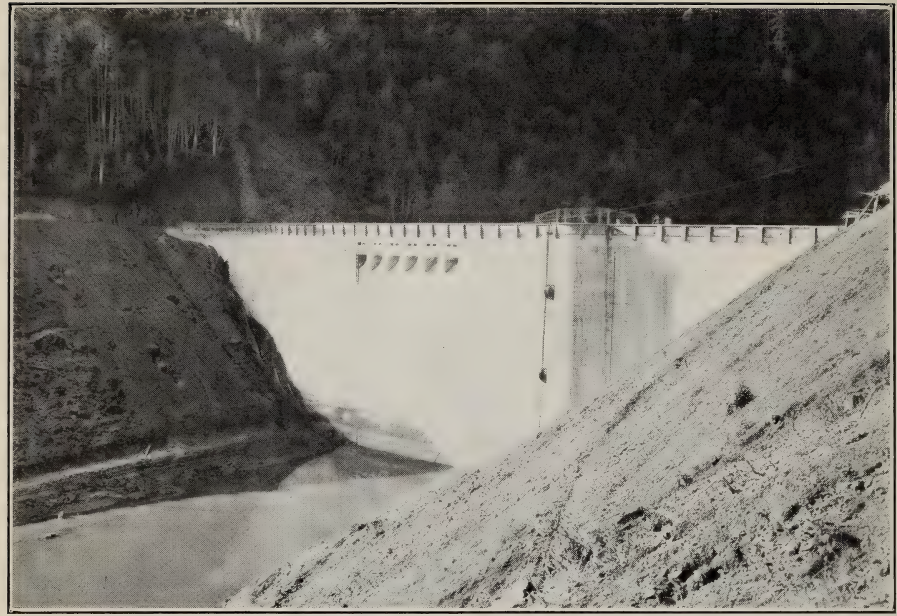
[5] Tulare District bought up its bonds at 53 cents and burned them in 1903.

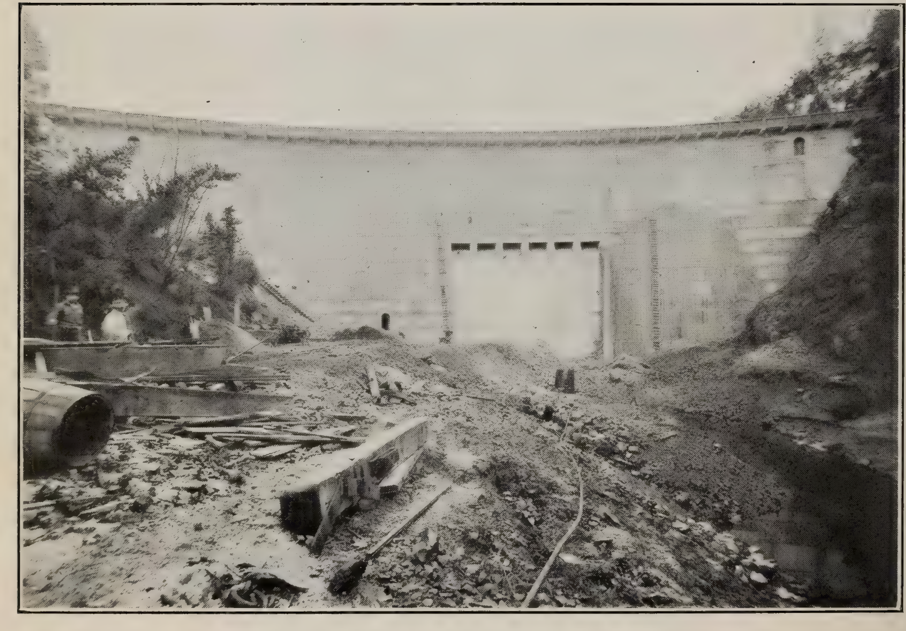
[6] Walnut District is the only one of the early organizations which has not had trouble. It never issued bonds.

[7] Less $640,000, Browns Valley and Tulare districts bonds paid and canceled.



Alpine Dam, Marin Municipal Water District.





Upper figure.—Alpine Dam, showing intake of siphon spillway.
Lower figure.—Downstream, showing outlet of siphon spillway.

MISCELLANEOUS.

STATE SUPERVISION OF DAMS. In former reports of this department, attention was called to the growing number of high dams being constructed for industrial purposes without supervision by public authority, and urged that proper safeguards to life and property should be provided by requiring all such structures to be submitted to state control as to plans and safe construction.

In response to the suggestions made for provision to place all dams under state inspection and supervision, the legislature enacted an amendment to the act creating the Department of Engineering, containing the following provision:

> It shall be the duty of the state department of engineering to pass upon all plans, specifications and estimates for the construction of dams now already constructed, in process of construction, or proposed to be constructed for the impounding of water other than the dams now coming under the authority of the California Railroad Commission. (Chapter 394, statutes 1915.)

The intent of the above quoted law is plain, but it is submitted that it confers little authority upon the Department of Engineering. ''To pass upon plans'' is not sufficient without authority to alter the plans if they are defective and to enforce compliance in construction with approved plans and specifications, or if structure is already constructed and found to be unsafe the state's agent should be clothed with power to compel the adoption of measures to make it safe.

The legislature in 1917 enacted a provision covering the subject, in chapter 377 (statutes 1917), as follows:

> SEC. 2. (*a*) All dams in the state of California, other than those for impounding mining debris constructed under the authority of the California debris commission, or dams constructed by a municipal corporation maintaining a department of engineering, shall be under the authority of the state department of engineering, and the department shall exercise supervision over any dam, the failure of which would endanger life or property, and shall have power to prescribe and enforce compliance with measures for making such dams safe against failure; *provided*, that this section shall not apply to any dam which is part of a ''water system'' as defined in section two of the public utilities act of this state, and nothing in this act shall be construed to limit the jurisdiction of the railroad commission over such dams.
>
> (*b*) It shall be unlawful for any person, firm, corporation or district to construct, maintain or operate any dam known to be unsafe, or which if the destruction or failure thereof would endanger life or property; or to construct, reconstruct, repair or improve, maintain or operate any dam which is or would be ten feet or more in height or which will impound water or other fluid to the amount of three million gallons unless the plans, specifica-

tions and construction thereof shall have been approved in writing by the state department of engineering.

(*c*) Any person, firm, corporation or district who shall violate the provisions of this section is subject to a penalty of not less than five hundred nor more than two thousand dollars for each and every offense. Each day that such violation of the provisions of this section shall continue shall be deemed and considered a separate and distinct offense.

(*d*) Any person acting for himself as owner, or as director, officer, agent or employee of any firm, corporation or district engaged in the construction, reconstruction, improvement or repair of any dam, the plans and specifications of which have been approved by the department of engineering, or any contractor, or agent or employee of such contractor, who shall knowingly permit work to be executed thereon contrary to the plans and specifications approved as aforesaid, or any inspector or employee of the department of engineering who shall have knowledge of such work being done and fail to immediately notify the department of engineering thereof, is guilty of a felony and subject to the penalty of confinement in the state penitentiary for not less than one nor more than five years.

(*e*) Upon the complaint of the department of engineering any district attorney is hereby authorized and directed to prosecute violations of the provisions of this section.

It will be observed that those dams constructed by mining interests under the jurisdiction of the United States Debris Commission, public utilities under the State Railroad Commission and municipalities having an organized engineering department are exempt from the jurisdiction of the Department of Engineering. Since that law became effective, July 15, 1917, the department has approved the plans and inspected the work upon the following dams, construction of which has been commenced or completed:

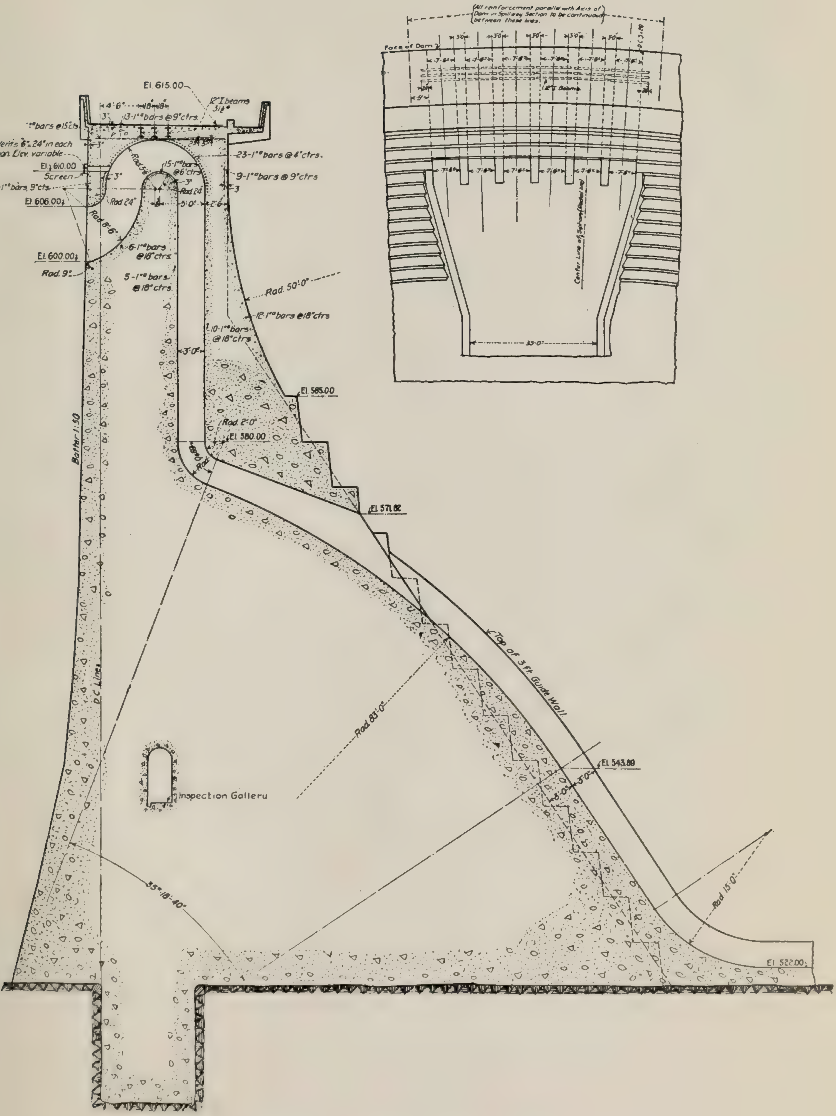
Woodward Dam.

Stanislaus County, eight miles north of Oakdale.
Owner: South San Joaquin Irrigation District.
Purpose: Storage for irrigation.
Type: Hydraulic earth fill.
Dimensions: Height 58 feet, base, maximum 300 feet, crown, 20 feet, length 3100 feet; storage capacity 49,000 acre-feet.
Source of water, diversion by canal from Stanislaus River.
Construction, completed May, 1918, cost $600,000.
Remarks: There are fifteen dikes or small dams across low places in the rim of the reservoir.

Paradise Dam.

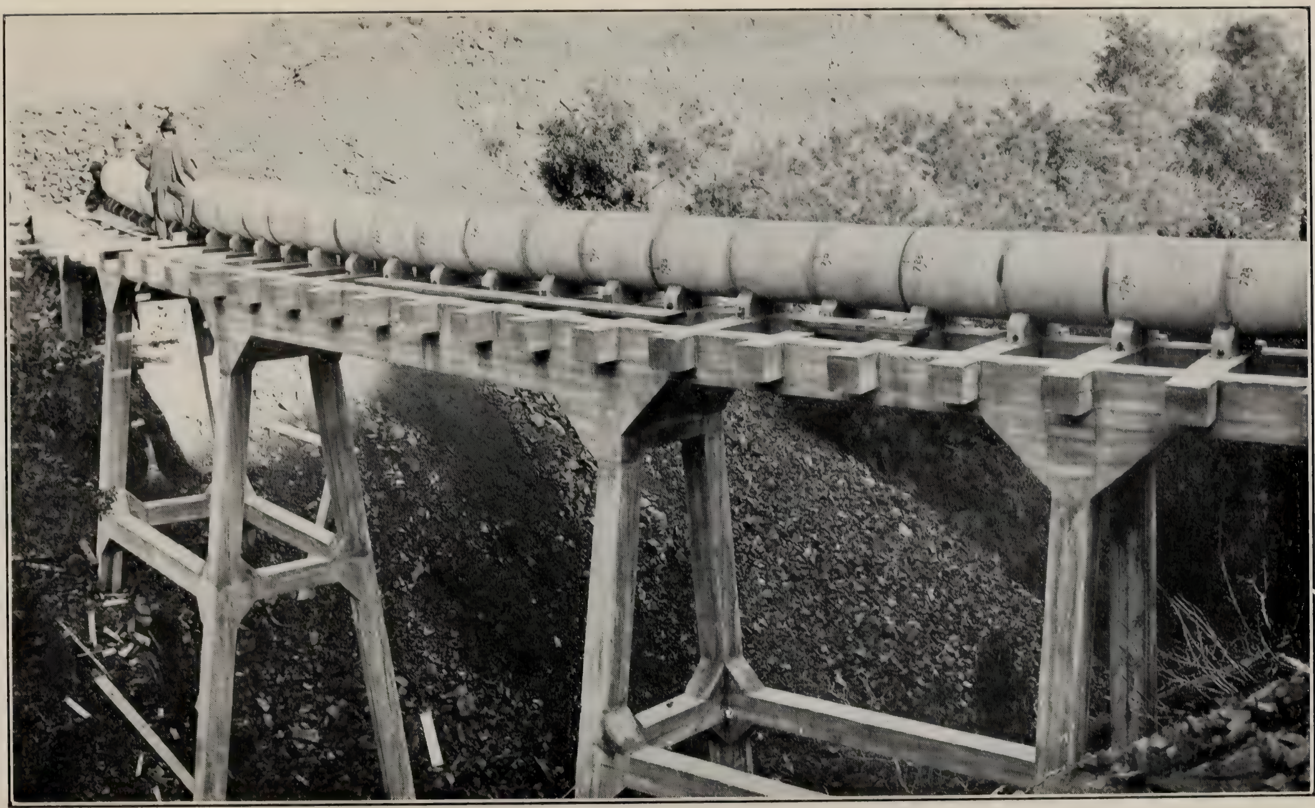
Butte County, one mile from Magalia.
Owner: Paradise Irrigation District.
Purpose: Storage for irrigation.
Type: Hydraulic earth fill.
Dimensions: Height, 100 feet, base, maximum 325 feet, crown, 20 feet, length, 1000 feet; storage capacity, 2545 acre-feet.
Source of supply: Little Butte Creek.
Construction completed April, 1918.

PLATE XXI.



Alpine Dam, section, siphon spillway.

PLATE XXII.



Concrete pipe and trestle, Marin Municipal Water District.

Lake Hodges Dam.

San Dieguito River, San Diego County, 25 miles north of San Diego.
Owner: San Dieguito Mutual Water Company.
Purpose: Storage for irrigation, domestic and municipal use.
Type: Multiple arch, concrete.
Dimensions: Height, 130 feet, base, maximum 155 feet, crown, 16 feet, length, 750 feet, including spillway at side; storage capacity, 37,000 acre-feet.
Source of supply: San Dieguito River.
Under construction, will be completed about December, 1918.

Alpine Dam.

Lagunitas Creek, Marin County, 8 or 10 miles northwest of San Rafael.
Owner: Marin Municipal Water District.
Purpose: Storage for municipal supply of several towns.
Type: Gravity, cyclopean concrete.
Dimensions: Height, 100 feet, ultimately to be 170 feet.
Capacity, 3180 and 19,550 acre-feet, respectively.
Source of supply: Lagunitas Creek.
Construction under way.

Dorris Reservoir.

Modoc County, 2½ miles east of Alturas.
Owner: Dorris Brothers (W. J. and J. Dorris).
Purpose: Irrigation.
Type: Earth.
Dimensions: Height, 21 feet, base, maximum 123½ feet, crown, 30 feet, length, 3000 feet.
Capacity: 6640 acre-feet.
Source of supply: Diversion ditch from Pine Creek.
Construction under way.

Little Rock Creek.

Los Angeles County, 8 miles from Palmdale.
Owner: Little Rock Creek and Palmdale Irrigation Districts.
Purpose: Storage for irrigation and domestic use.
Type: Concrete multiple arch.
Dimensions: Height, 200 feet, length 440 feet, base, 233 feet, crest, 16 feet.
Capacity: 7460 acre-feet.
Source of supply: Little Rock Creek.
Construction not commenced.

The plans for several other dams have been submitted, but not yet passed upon.

BRIDGES. The law imposes upon the State Engineer the duty of passing upon the plans of all bridges to be erected over navigable waters of the state, and to prescribe the width of draw and of water channel.

The department in every instance acts in conjunction with the engineers of the War Department who have jurisdiction over navigable waters, and declines to approve any structure that is not satisfactory to them.

During the biennium just closing the department has considered plans for bridges as follows:

Sacramento-Solano.
Joint highway bridge over Sacramento River, near Rio Vista. Approved.
Type of bridge: Swing span, six truss spans and pile trestle approaches.
Width of draw: 226 feet.
Width of waterway: 2433 feet.
Length over-all: 2433 feet.
Remarks: Under construction, nearly completed.

Sacramento County Highway.
Bridge over Sacramento River, near Isleton. Considered.
Type: Bascule, truss span approaches.
Width of opening: 225 feet.
Width of waterway: 625 feet.
Length over-all: 1706 feet.
Remarks: Under consideration by the War Department.

Princeton—Colusa-Glenn Counties.
Highway bridge over Sacramento River at Princeton.
Type: Bascule.
Width of opening: 226 feet.
Width of waterway: 2 truss spans, 210 feet each, trestle, 470 feet, total 906 feet.
Remarks: Not commenced.

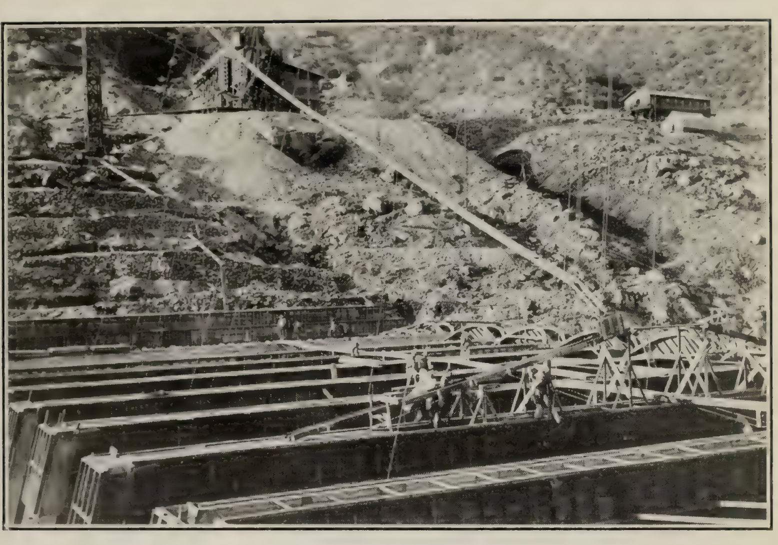
Feather River.
Nicholas—Sutter County Highway Bridge.
Type: Swing.
Width of opening: 100 feet each side of pivot pier.
Width of waterway: 3 truss spans, 525 trestle, 941 feet, total 1666 feet.
Length over-all: 1706 feet.
Remarks: Under construction.

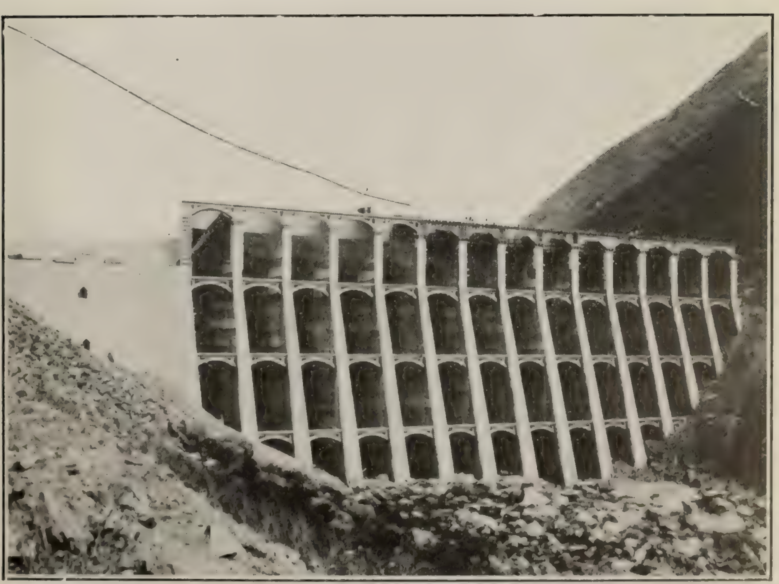
Mad River Slough.
Humboldt County highway bridge.
Type: Single leaf bascule.
Width of opening: 38 feet.
Width of waterway: 232 feet.
Length over-all: 250 feet.

Cutoff Slough and Salt Slough.
Humboldt County private causeway.
Type: Earth embankment.
Width of opening: None.
Width of waterway: None.

Remarks: These sloughs are blind channels in the delta lands of Eel River. They lie wholly within the property of one large estate, and are not used for navigation purposes, but fall within the definition of navigable streams of the statute, "all streams capable of floating logs, etc." The owners of the lands through which they pass petitioned the War Department for permission to construct a causeway by means of an earth fill across both channels, in lieu of drawbridges. The engineer corps of the War Department, considering that, as the channels are not in fact navigable, the United States did not have jurisdiction, referred the matter to this office. An investigation was made and the above recited facts ascertained, but as the department could not set aside a definition of law, declined to act. It is understood that the petitioners have since constructed the dams which will probably be allowed to remain until some one makes a showing of injury to navigation.

PLATE XXIII.

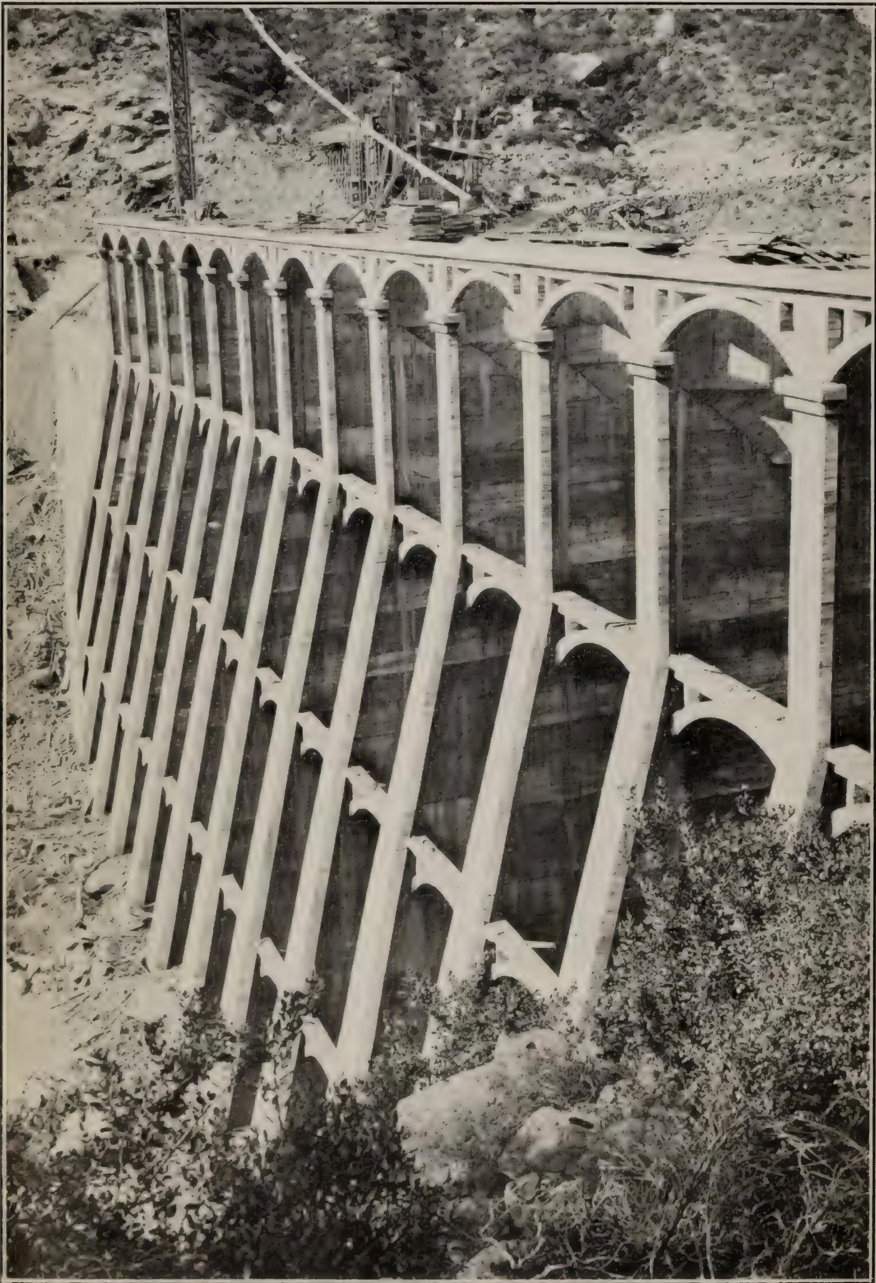




Upper figure.—Multiple-arch dam, concrete pier foundations, Lake Hodges Reservoir.

Lower figure.—Same in construction, September 21, 1918.

PLATE XXIV.



Lake Hodges Dam, San Dieguito River, October 19, 1918.

SAN FRANCISCO HARBOR FRONT.

The harbor front of the city of San Francisco is state property and
administered by a Board of State Harbor Commissioners, which has
risdiction over the construction, operation and maintenance of the
cks, wharves, buildings and appurtenances of every kind. The board
ports directly to the Governor.

All engineering, including design and construction, is by law placed
the Department of Engineering, and is exercised through a chief
gineer of the Board of Harbor Commissioners appointed by the
partment.

Mr. Frank G. White was appointed chief engineer July 7, 1916.
is report covering the two years ending June 30, 1918, appears here-
after in full.

It will be noted that the work of improvement, extension and addi-
ons to the wharf piers, sheds, and other equipment of the harbor has
rogressed steadily, despite the depression of the times.

To meet war necessities, the Belt Railroad was extended from the
ransport Docks at Laguna street to the Presidio, and connected with a
stem of yard tracks constructed by the War Department for the
andling of war materials. The extension was completed and connec-
ons made within two months after war was declared. A two-story
uilding was erected at the foot of Jones street for the use of the
. S. Customs, Coast Guard and Quarantine Service. Also a building
ntaining offices, waiting room, freight room, etc., was erected on
ier 14, for the accommodation of the U. S. Naval Training Station on
erba Buena Island.

An item of the report which is not likely to attract much attention
om the casual reader and yet is of more than passing interest, is the
ference to Pier 42, the condition of which shows the need for using
od materials and of employing efficient inspection in public works.
he piles supporting the pier were encased with concrete as a protection
om marine borers. The report says that "the concrete protection had
isintegrated and washed out, leaving the piles exposed." The piles
ere eaten off by the *terredo,* and with the concrete debris, had fallen
the bottom of the bay. Complete reconstruction was necessary.

In this connection it is desired to call attention to the fact that this
ier was constructed in 1906, before the Department of Engineering
as created and the harbor work entrusted to engineers selected by it.
n an early report of the department that method of construction as
sed in piers constructed under former regimes was discussed and it
as stated that "in the depositing of the concrete around the piles there
as little, if any, cementing power between the sacks of concrete."

No such work has ever been permitted since the Department of Engineering took charge of public construction.

Reference is briefly made to freight handling machinery to be installed in the sheds of Pier 3. This is a step in the right direction and one that it is hoped will be followed by many more of the same kind. To the public the most conspicuous improvements made or being made is the rebuilding of the sheds on Pier 46, which was destroyed by fire in 1915, and the construction of an overhead viaduct from the Ferry Building across the Embarcadero.

Chief Engineer White's report here follows:

REPORT OF CHIEF ENGINEER SAN FRANCISCO STATE HARBOR COMMISSION.

By Frank G. White, Chief Engineer.

I beg to submit herewith for your consideration my report as Chief Engineer of the Board of State Harbor Commissioners, for the two fiscal years beginning July 1, 1916, and ending June 30, 1918.

At the time of the presentation of the last biennial report on July 1, 1916, by my predecessor, Mr. Jerome Newman, there were under construction the following structures:

Pier No. 29, which was 68 per cent completed.

Repairs and additions to Pier No. 7, which were 85 per cent completed.

Repairs and additions to Pier No. 11, which were 50 per cent completed.

Repairs and additions to Pier No. 44, which were 5 per cent completed.

Addition to Pier No. 38, which was 2 per cent completed.

This work was all described in the last report and the structures have all been completed and placed in service.

For the purposes of this report, the work of the engineering department will be divided as follows:

1. Construction, piers, wharves, etc.
2. Maintenance and repairs.
3. Belt Railroad.
4. Buildings.
5. Paving.
6. Electrical.
7. Dredging.
8. Testing.
9. Designing and drafting.
10. General.

1. Construction, Piers, Wharves, etc.

Pier 3. This pier was constructed on the site of old Pier No. 3 and was designed for the use of river boats plying between San Francisco and points on the Sacramento and San Joaquin rivers. It is 138 feet in width and 706 feet in length and is constructed of reinforced concrete throughout. The supports are reinforced concrete piles which average from 90 to 100 feet in length. There is a depressed track on the north side and seven adjustable cargo aprons are provided to facilitate trucking between the boats and the pier. On these aprons the transportation company which will occupy the pier is installing motor driven chain conveyors to expedite the trucking at low stages of the tide. The fender line is the ordinary type with creosoted piles and untreated sheathing and the pavement is bituminous concrete in the driveway and sheet asphalt in the cargo areas.

In conjunction with the pier a section of reinforced concrete bulkhead wharf 423 feet in length and 45 feet in width was constructed as well as a passenger landing pier 76 feet by 99 feet.

The contract for the construction of the pier shed included a bulkhead wharf ilding and a waiting room on the passenger landing pier. The main pier shed is 9 feet in length and 112 feet in width with a passenger gallery extending along e side for about one-half its length. The bulkhead building is 398 feet in length 30 feet in width and two stories high. In it will be located ticket and freight fices as well as the general business offices of the transportation company, baggage om, commissary, carpenter shop, etc. The waiting room on the passenger pier is feet by 88 feet.

The buildings are all timber frame structures and the walls for a height of four et are reinforced concrete. The remainder of the front wall of the bulkhead ilding is of metal lath and plaster on wood sheathing. On the rest of the buildgs the walls above the reinforced concrete portion are two-inch solid mortar walls ilt up with a cement gun on ribbed metal lath.

Pier 3 was completed in March, 1918, and the pier shed, bulkhead building and ssenger building were 40 per cent completed on June 30, 1918.

Pier 31. This pier is 150 feet in width and 800 feet in length. The type of nstruction is similar to that of Pier 29 adjoining it, the inner 590 feet being suprted on reinforced concrete piles and the outer 210 feet on concrete cylinders hich in turn have a foundation of timber piles. The deck is of reinforced concrete d the fender line and pavement are the same as on Pier 3. There is a flush ack on one side and a depressed track on the other.

In conjunction with the pier there were constructed a section of bulkhead wharf 6 feet in length and 45 feet in width, and a wharf 150 feet in width and 245 feet length connecting Piers 29 and 31. The bulkhead wharf and connecting wharf are so of reinforced concrete construction on concrete piles.

The plans for the pier shed include a building over the connecting wharf and lkhead wharf. The latter building extends across the front of Pier 29 and has a ngth facing the Embarcadero of 610 feet. The buildings are timber frame structures d the walls are all of reinforced concrete excepting the frontwall of the bulkhead ilding which is cement plaster on metal lath.

Pier 31 was 97 per cent completed on June 30, 1918. The contract for the ildings has been let but their construction has not yet been begun. It is expected at they will be completed about December 1, 1918.

Pier 33. This pier is 803 feet in length and 150 feet in width. Except for the ct that the entire structure is built on concrete piles, the construction is the same Pier 31, with the same track arrangement, fender line and paving.

The contract for Pier 33 included the construction of a section of reinforced ncrete bulkhead wharf 45 feet in width and 440 feet in length. This connects e sections which were built in conjunction with Piers 31 and 35 and completes the rmanent bulkhead wharf from the north side of Pier 27 at Lombard street to e north side of Pier 41 at Powell street. Pier 33 was 87 per cent completed on ne 30, 1918.

Pier 46. On June 4, 1916, Pier 46, which was completed about the last of ptember, 1914, was destroyed by fire. Portions of the deck along the north side the pier were uninjured and the majority of the creosoted piles were in good ndition below high tide but the shed and the greater part of the deck structure re entirely destroyed. There was considerable discussion as to whether the pier ould be rebuilt of timber or whether it should be removed and replaced with a inforced concrete structure. It was finally decided to rebuild the timber structure d this was done by cutting off the burned portions of the piles, subcapping with eosoted timbers and building up to the deck level with short posts braced in both rections. The deck planking was covered with a bituminous pavement and a fferent type of shed was designed which, while of timber, would be more firesisting. A bulkhead building covered with metal lath and plaster was also planned as to harmonize with the front under construction on Pier 44. The pier conruction was started by Harbor Commission forces but later contracts were let for e different parts of the work. The pier was completed in November, 1917, the er shed in December, 1917, and the bulkhead building in February, 1918.

Islais Street Wharf. The construction of this wharf was the initial step in the development of the Islais Creek-India Basin district. It covers the full width of Islais street along the south side of the Islais Creek Channel and extends from Third street west to Selby street. It is 1646 feet in length and 80 feet in width except for a distance of 180 feet from Third street, which is 66 feet in width. It is a creosoted pile timber structure covered with a bituminous pavement and has a railroad track extending its entire length. The Islais street wharf was completed in January, 1918.

Pier 42—Reconstruction. This pier was constructed in 1906, the supports being untreated piles protected by concrete deposited inside wood stave cylinder forms. Examinations by divers showed that in many cases the piles were in bad condition due to the fact that the concrete protection had disintegrated and washed out, leaving the piles exposed. In fact, in some cases the piles had been eaten through and with the protecting concrete, had fallen to the bottom of the bay. It was decided to remove all of the protected piles and replace them with creosoted piles. At the same time the shed and deck were rebuilt and the latter was covered with a bituminous pavement. The railroad track along the north side of the pier was also connected with the Belt Railroad which now does the switching. The contract also included a section of reinforced concrete bulkhead wharf 46 feet in width and 539 feet in length and a bulkhead building at the inner end of the pier shed. The reconstruction of Pier 42 was completed in June, 1918.

Pier 40—Addition. An addition about 19 feet in width was constructed along the north side of Pier 40. This addition carries a depressed railway track and was constructed on account of the congestion incident to the operation of the flush track in the center of the pier. It is constructed of timber on creosoted piles and has the typical creosoted pile fender line. The addition to Pier 40 was completed in August, 1917.

Pier 43—Addition. An addition 52 feet in width and 200 feet in length was constructed on the outer end of Pier 43. It is a creosoted pile timber structure and carries two railroad tracks. The addition was completed in February, 1917.

Bulkhead Wharf—Pier 9. A section of bulkhead wharf 45 feet in width and 233 feet in length was constructed at the inner end of Pier 9. It connects the sections previously built adjacent to Piers 7 and 11 and completes the permanent bulkhead wharf from the south side of Pier 7 to the south side of Pier 19. It is the typical reinforced concrete bulkhead wharf construction on concrete piles. The work was completed in August, 1917.

Breakwater—Fishermen's Lagoon. In order to furnish a safe harbor for the growing fleet of fishing boats, a breakwater was constructed along the Embarcadero from Jones street to Hyde street with a wingwall extending back along Hyde street to Jefferson street. The area within the breakwater was then dredged to the required depth. From time to time the wharves will be constructed inside of this lagoon for the use of the fishing boats. The breakwater was completed in May, 1917.

Wharf Between Jones and Hyde Streets. The existing wharf on the Embarcadero between Jones and Leavenworth streets was enlarged and extended toward Hyde street and is now used for handling lumber. The old portion which was 411.5 feet in length and 60 feet in width was widened to 120 feet and an extension 180 feet in length and 120 feet in width was constructed on the west end. The wharf is of creosoted pile and timber construction and was built by Harbor Commission forces. The work was completed in June, 1918.

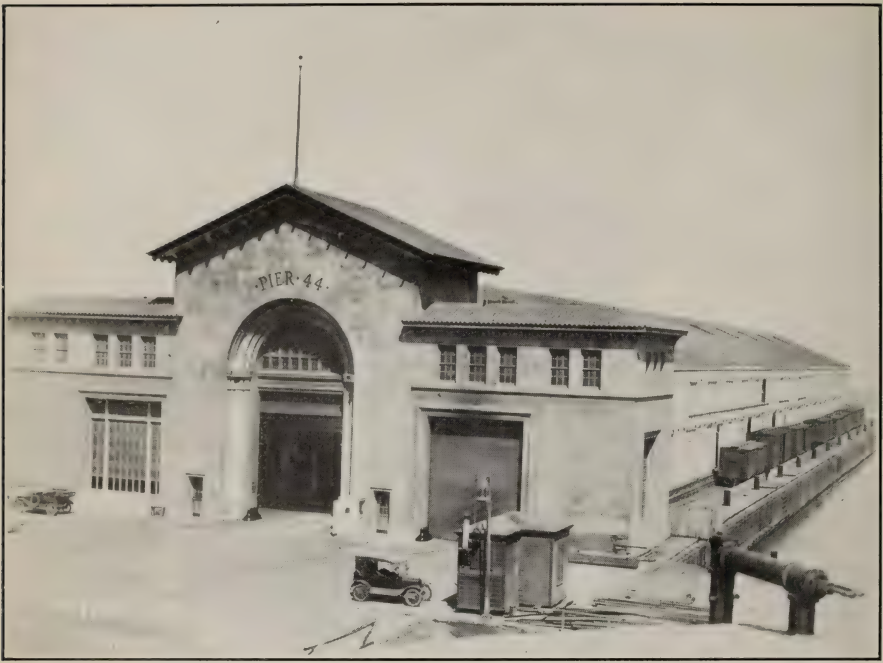
2. Maintenance and Repairs.

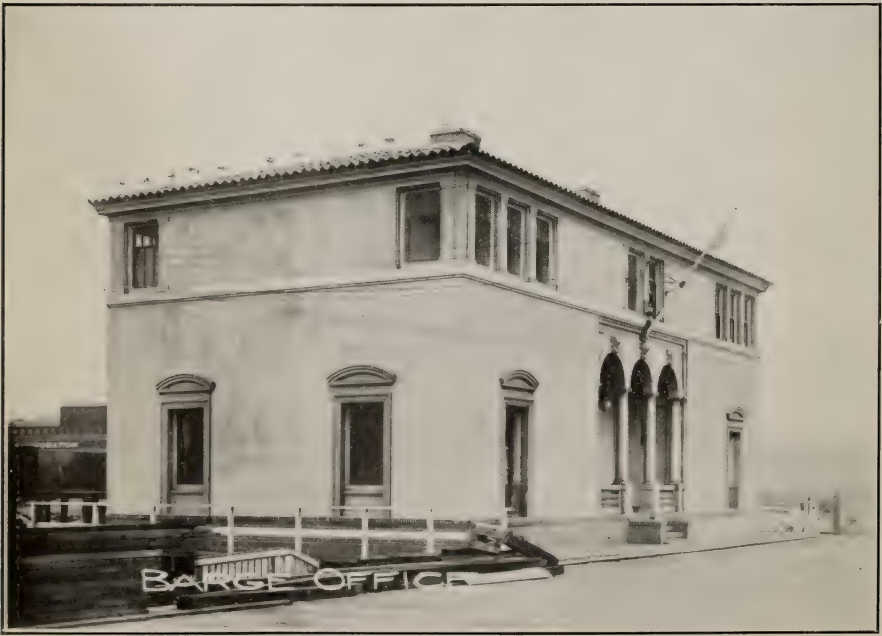
Coincident with the large increase in the harbor facilities and in the tonnage handled, the work of maintaining the property under the jurisdiction of the board has also very largely increased. An efficient maintenance and repair department has been constantly at work and all structures have been kept in good operating condition. During the last year, it has been necessary to begin making extensive repairs to the untreated timber sheathing on the suspended fenders and the creosoted pile fenders. This was to have been expected and experience has proven that these

PLATE XXV.

Upper figure.—Pier No. 11, San Francisco Harbor.
Lower figure.—Typical pier shed.

PLATE XXVI.





Upper figure.—Pier No. 44, San Francisco Harbor.
Lower figure.—Barge office.

types of fenders are much more economical to maintain than the old type of green pile fenders.

While most of the work was done by the maintenance and repair department, some of the larger jobs were done by contract. Of these the most important was the raising of the bulkhead wharf, between Howard and Harrison streets. On account of the nature if the subgrade upon which the sea wall in this locality was constructed, it settled, carrying with it the bulkhead wharf and bulkhead buildings. The greatest settlement occurred at the foot of Folsom street and amounted to about four feet. The work of raising the bulkhead wharf extended over a distance of 1150 feet. The concrete piles were cut off below the deck, the entire deck structure was jacked up to grade and the piles and bulkhead wall were built up to the necessary height to take the bearing. The work was carried out without interrupting the use of the structure above and was completed in April, 1917.

3. Belt Railroad.

The regular maintenance work of the Belt Railroad has been kept up and numerous private industry tracks have been constructed by the track-laying force. Several additional yard tracks were also built and the track laying on new piers was done by our own force.

Shortly after the declaration of war in April, 1917, the board was requested by the War Department to extend the Belt Railroad from the Transport Docks at Laguna street to the Presidio. This the board ordered done and the work was laid out so as to co-ordinate with the plans of the city for the construction of the Marina boulevard. The track was extended to the Presidio line and connected to the yards and sidings which were constructed by the War Department. The connection was made in June, 1917.

4. Buildings.

Contrary to the previous policy of the department and in order to expedite the work of construction it was decided to let separate contracts for pier and pier shed construction. This was first done in the case of Pier 29 and the same course was pursued with Piers 3, 31, 33 and 46, the buildings on which have already been described.

Pier 29—Shed. This building is a combination timber and steel frame structure with concrete walls, steel rolling doors and a corrugated iron roof. As constructed, it is 160 feet in width and 762 feet in length. As has been stated, the bulkhead building will be constructed in conjunction with the shed on Pier 31 and the adjacent connecting wharf. The shed on Pier 29 was completed in July, 1917.

Pier 41—Shed. Pier 41 was constructed in 1914 without a shed and was used for handling bulk cargoes, especially lumber. The need for covered cargo space, however, became so pressing that it was decided to construct a shed on this pier. The building is a timber frame structure with two-inch redwood siding and a roof of two-inch by four-inch redwood laid on edge, the construction being identical with that of the shed on Pier 46. The shed as constructed is 160 feet in width by 870 feet in length. Later it is the intention to extend the shed to the inner end of the pier and to construct a bulkhead building across the front. The shed on Pier 41 was completed in May, 1918.

Barge Office. A building to be used as waterfront offices and quarters by the U. S. Customs, Coast Guard and Quarantine Service was constructed on the Embarcadero near the foot of Jones street. It is a two-story building 33 feet by 67 feet. The foundation is reinforced concrete piles and the building is a timber frame structure, the outside being covered with metal lath and plaster. The Barge Office was completed in December, 1917.

Pier 36—Addition to Shed. The existing shed on Pier 36 was extended inshore to the waterfront line, the addition being 98 feet in width and 140 feet in length. The building is a timber frame structure with a four-inch redwood roof. The walls are of reinforced concrete for a height of about four feet and for the remainder of the height they are two-inch solid plastered walls on ribbed metal lath. The addition to the shed on Pier 36 was completed in October, 1917.

Wells-Fargo Building Addition. To care for the growing express business of Wells-Fargo and Company, an addition was constructed at the east of the building on Pier 14. The addition is irregular in shape but is approximately 100 feet in width by 270 feet in length. A portion covering an area 61 feet by 82 feet is two stories in height and the rest of the building is one story. It is a timber structure throughout. The addition to the Wells-Fargo Building was completed in May, 1918.

Naval Training Station Building. A building for the use of the U. S. Naval Training Station at Goat Island was constructed near the outer end of Pier 14. It is a one-story building 21 feet by 60 feet and contains a waiting room, offices, freight room, etc. The building is a timber frame structure covered with metal lath and plaster. It was completed in March, 1917.

Viaduct. Contracts have been let for the construction of a viaduct extending from the second floor of the Ferry Building across the Embarcadero to the west side of the street. It will leave the building about 50 feet north of the center and will land on the sidewalk on the west side of the Embarcadero near the north side of Market street. The viaduct will have a total length of 293 feet with four spans and a sidewalk width of 13 feet. It is expected that it will be completed about the first of December, 1918.

5. Paving.

The regular maintenance work on the pavement on the Embarcadero has been kept up and on account of the settlement of new fills, several areas of considerable extent were repaired by our street repair force. In addition, considerable work was done by contract, both on the Embarcadero and on other streets under the jurisdiction of the board.

Bay Street to Powell Street. This was the first section which was paved in accordance with the policy adopted by the board of providing a strip of bituminous pavement along the Embarcadero. It consisted of a strip of bituminous concrete pavement on a 6-inch concrete base 30 feet in width and 1935 feet in length. The work also included the construction of a cement sidewalk 20 feet in width, setting granite curb, the relaying of a portion of the basalt block pavement adjacent to the new work, and the construction of the necessary catch basins and drains.

Pacific Street to Union Street. This consisted of a strip of bituminous concrete pavement on a 6-inch concrete base, 40 feet in width and 1455 feet in length. The contract also included a granite curb for a portion of the distance, repairing with basalt blocks adjacent to the new pavement and the construction of drains and catch basins.

Folsom Street to Harrison Street. Following the completion of the work of raising the bulkhead wharf and bulkhead wall in this vicinity, a portion of the width of the Embarcadero was paved with basalt blocks. After the new fill on which this pavement was laid has settled sufficiently under traffic, the blocks will be removed and replaced by bituminous concrete.

King Street, Second Street to the Embarcadero. The existing pavement along this block was removed and replaced by a basalt block pavement on a 6-inch concrete base.

Folsom Street, Steuart Street to the Embarcadero. This block was paved with basalt blocks on sand. The contract also included the construction of granite curb, drains and catch basins.

The Marina, Laguna Street to Buchanan Street. The construction by the city of the first section of the Marina Boulevard necessitated the paving of the Belt Railroad track in this block. The work consisted of Topeka pavement on a 6-inch concrete base.

All of the above-mentioned work has been completed and is in service.

Washington Street to Market Street, and Howard Street to Folsom Street. These two sections of the Embarcadero are to be paved with bituminous concrete on a concrete base. The contracts have been let and the work is expected to be completed in September, 1918.

6. Electrical.

As in the past, all maintenance work and also all electric installations along the waterfront have been handled by our own electrical department. The work of extending the underground conduit system and the street lighting system has been carried on progressively and both are now complete from Channel street to Mason street.

As fast as new buildings have been constructed or existing buildings reconstructed, they have been permanently wired and high efficiency nitrogen lamps have been installed. This work has been done on Piers 7, 11, 15, 29, 41, 36, 42, 44 and 46 and in the Barge Office, Naval Training Station Building and Wells-Fargo Building addition. Piers 42 and 46 have also been wired for ship lighting and for furnishing power for cargo conveyors.

To assist in policing and patrolling, flood lights and projectors have been installed at advantageous points so as to light the sides and ends of the piers. These lights have been placed at Piers 41, 39, 37, 35, 26, 30, 32, 34, 42 and 46.

The efficiency of the electrical department in safeguarding the water front against disastrous fires has been increased by the appointment of an experienced fire marshal and by the installation of fire fighting apparatus. Eleven fire monitors have been placed on the roof of the Ferry Building and adjoining buildings, and 4000 feet of 2½-inch hose has been provided and mounted on thirty hose racks located in different parts of the building.

High pressure fire mains have been installed on Piers 35 and 37 with 1000 feet of 1½-inch hose mounted on ten hose racks on each pier, and each system is provided with connections for the city fire engines and fire boats as well as being permanently connected with the Spring Valley Water Company's water mains. Contracts have been let and work is proceeding on the installation of similar systems on Piers 3, 29, 31, 33 and 46.

Each pier is equipped with a 40-gallon portable chemical tank and the system of fire alarm boxes is being extended as is required.

The fire marshal makes periodical inspections of all fire equipment and also of all structures with a view to eliminating all fire hazards as far as possible. The hose is taken down and tested at intervals in order to be sure that it is always in first-class condition.

7. Dredging.

The regular dredging has been carried on as usual and the necessary depth of water has been maintained in all slips. In addition, extensive dredging operations have been necessary in the slips adjacent to the piers which have been recently constructed. The new fishermen's lagoon has been dredged so as to provide sufficient depth of water for the steam fishing tugs.

Dredging has been begun along the southerly portion of China Basin and large quantities of rock have been removed and used for straightening out and building up the seawall. This has accomplished the double purpose of securing the necessary depth of water and obviating the necessity of purchasing seawall rock.

The dredging plant has been maintained in a good state of efficiency and the department has been complimented by the inspectors of the Industrial Accident Commission on account of the good condition of the dredgers.

8. Testing.

The testing laboratory has proven indispensable in the carrying out of the extensive construction program of the last two years. All construction materials such as cement, structural and reinforcing steel, asphalt, roofing materials, paints, oils, etc., have been tested and analyzed and screen analyses have been made of sand, gravel and crushed rock for use in concrete. Samples of the concrete used in all construction work have been taken regularly and tested.

The testing for the State Department of Engineering has been carried on as in the past. All of the cement which the Department has used has been tested in our laboratory and in addition many tests have been made of concrete samples and of all sorts of building materials.

9. Designing and Drafting.

In addition to the plans for work which has been completed or which is under construction and which has been previously mentioned, the following plans have been prepared and are ready for placing under contract:

Extension to Pier 21; 108 feet in width and 200 feet in length, creosoted pile and timber construction.

Extension to Pier 22; 125 feet in width and 200 feet in length, creosoted pile and timber construction.

Bulkhead Wharf Adjacent to Pier 27; 45 feet in width and 64 feet in length, reinforced concrete construction.

Bulkhead Wharf at China Basin, extending from the entrance to Channel street to Pier 54; reinforced concrete structure 47 feet in width and 2145 feet in length.

Fish Packing House and Market at the Foot of Taylor Street; 47 feet in width by 100 feet in length, two stories in height, reinforced concrete construction.

Extension to Post Office; an addition to the second floor, 34 feet in width by 109 feet in length, structural steel, brick and concrete construction.

The following plans are well under way and will be completed in the near future:

Shed on Pier 33 and adjacent bulkhead wharf.

Extension of the existing shed on Pier 41, and shed on the adjacent bulkhead wharf.

Pier 1 to replace the existing pier at the foot of Washington street.

Permanent bulkhead wharves to replace the existing wharves in front of Pier 19 and from Pier 21 to Pier 27.

Plans for the improvement of Fishermen's Lagoon by the construction of a new free market, fish stalls, wharfinger's office, boat shops, boat ways, oil stations, net tanning house, and wharves, and wharf sheds for the wholesale fishing companies.

General plans for the development of the China Basin section and the India Basin-Islais Creek section of the waterfront.

10. General.

The unsettled conditions in all quarters due to the war have made construction programs difficult of fulfillment and it has been impossible in most cases to carry out previously arranged schedules. The shortage and inefficiency of labor and the difficulty of securing materials have increased steadily during the last two years and the cost of construction work has correspondingly increased. For these reasons it will probably be necessary to postpone the construction of part of the improvements mentioned above for which plans have been or are being prepared and to construct at the present time only such as are urgently needed.

On August 28, 1917, pursuant to your instructions, I left San Francisco for an inspection trip to the principal ports of the United States and Canada. I visited the most important ports on the Pacific and Atlantic coasts as well as on the Great Lakes and the Gulf of Mexico. I also attended the annual conventions of the Pacific Coast Association of Port Authorities at Portland, Oregon, and of the American Association of Port Authorities at Cleveland, Ohio. The entire trip covered a period of seven weeks and was outlined in a report to your honorable board, prepared after my return.

In February, 1918, I went to Seattle to investigate and report concerning the importation and handling of Oriental vegetable oils. The results of my investigations and recommendations as to the policy to be pursued in San Francisco were reported on March 5, 1918.

In conclusion, I desire to acknowledge the co-operation and efficient services of all employees of the Engineering Department.

San Francisco, Cal., July 1, 1918.

CANALS AND CANALIZATION.

The subject of navigation of inland waterways has engaged the attention of the people of California for a long time. In fact the first legislature, convened before the state was admitted to the Union, created a commission to study the subject.

The paralysis of rail transportation by the demands of war necessities has emphasized the need of supplementing the railways by other modes of transport.

Good highways are destined to play an important role in the development of the country, but for all that the waterways are capable of assisting in no small degree. Indeed, there are large areas of the most productive land in the state that by physical conditions are precluded from conveying their products to market in any other way than in boats.

Some years ago the legislature directed the Department of Engineering to investigate the subject of improving the rivers by canalization and constructing canals throughout the valleys of the state.

Without funds the department has been unable to make surveys, but whenever opportunity offered in the prosecution of other duties studies have been made on the subject.

In the last report of the department it was stated that:

> It is engineeringly feasible to construct tidal canals capable of conveying ocean-going ships to Sacramento and Stockton, at a comparatively low cost.
>
> It is engineeringly feasible to extend those canals several miles farther into the interior, with locks.
>
> Ships can be conveyed by canal within a few miles of San Jose.
>
> It is no greater engineering problem to build a lock-canal for ships from the sea to the heart of the city of Los Angeles than it was to build the great Manchester Canal.
>
> It would be no greater an engineering feat to build a barge canal from Red Bluff to Bakersfield than is the one now nearly accomplished of constructing the New York Barge Canal from Albany to Buffalo to accommodate barges carrying two thousand tons—the same distance and same elevations to overcome.
>
> Investigations have not gone far enough to show what the costs of construction or of operation of such canals would be.
>
> That all or any of the above are industrially feasible is not the province of this department to say, but it is urged that the question of cheap transportation is of such great importance to all that it should engage the earnest attention of the legislature to the end that an intensive study be made of the whole subject.

Following the suggestions contained in the above quotation, the Chamber of Commerce of Sacramento provided funds and requested the department to specially prosecute its studies on the feasibility of constructing a ship canal from Sacramento, connecting with deep water in the bay of San Francisco.

A survey was made under the direction of the department which developed the entire feasibility from an engineering standpoint of such a canal. Unfortunately, just as the surveys were being completed, the calls of war made it necessary to release nearly the entire force engaged on the survey, and the remaining members of the department have been physically unable to devote enough time from their routine duties to prepare the data for a report to the city of Sacramento. It is hoped, however, this may soon be done.

Attention is invited to the discussion in another chapter* of a threatened conflict between navigation and irrigation, and to the need of intensive study of the claims of both with a view to adopting measures for the preservation of both. With the close of the war and the return of the ''boys'' of the department who are with the colors, if funds are available, the department can vigorously prosecute the research needed.

SNOW STUDIES.

In previous reports of the Department of Engineering, the desirability of being able to forecast the probable magnitude of floods and the duration of run-off for all streams furnishing water for use, has been discussed. The department, in co-operation with agencies of the federal government, is measuring the quantity of water flowing in the streams at all times, and conducting research into the uses of water. It is known now with a fair degree of accuracy the average quantity of water discharged by the principal streams of the state every year, as well as the maximum volume of flood waters that are likely to be produced at any one time.

It is contemplated that ultimately reservoirs will be built in the mountains to retain a portion of the floods, so as to reduce the quantity to be cared for by the flood-control works in the valleys. This same water will then be used for irrigation and other purposes.

But it will be necessary to know beforehand when to begin filling the reservoirs. If they should be filled with early flow of water before it has reached flood stage, and then a flood came, there will be no place to store any of it. On the other hand, if they are held empty until flood danger is past, there may not then be enough to supply the needs of irrigators and other users.

Every artificial reservoir is accurately measured and gages show every day the quantity of water they contain, but nothing is known of the quantity back of them which is yet to come. The source of all floods and of the major part of the late-season flow is the vast snow fields about the heads of the streams.

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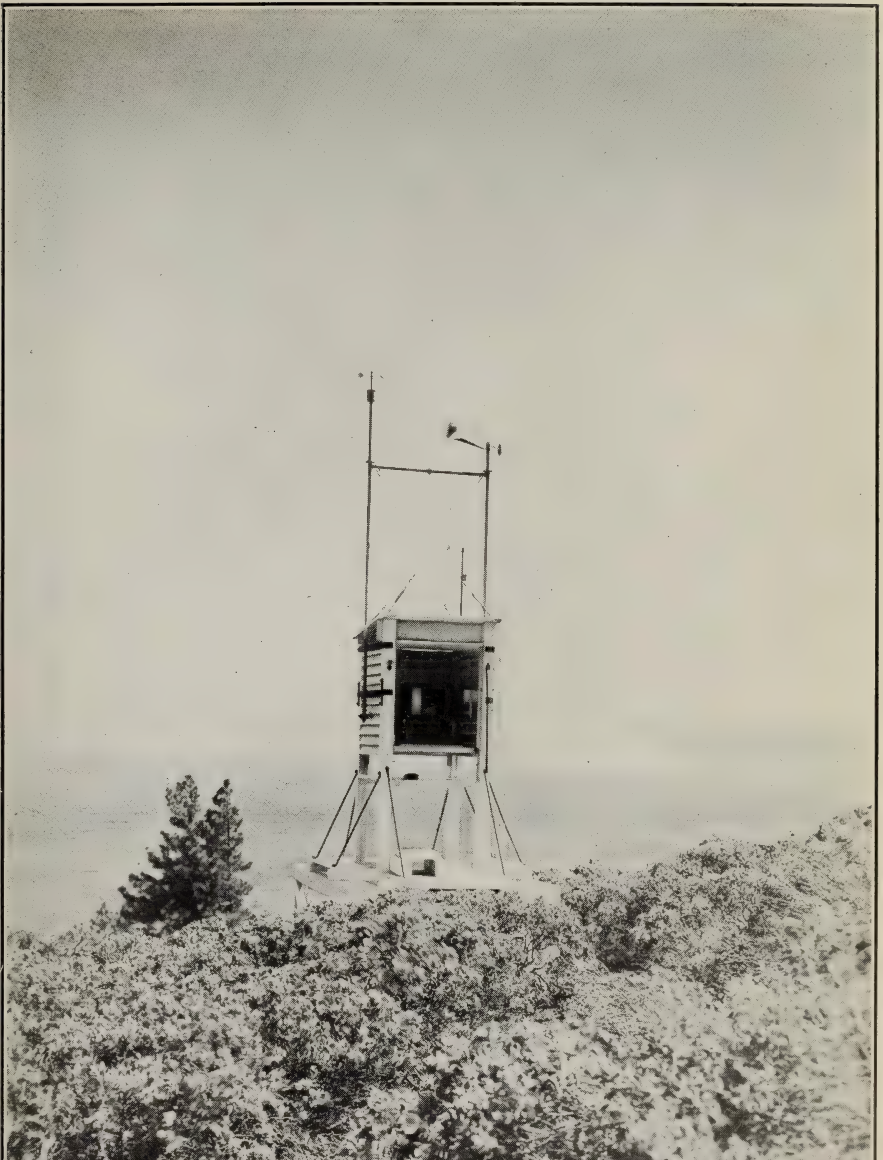
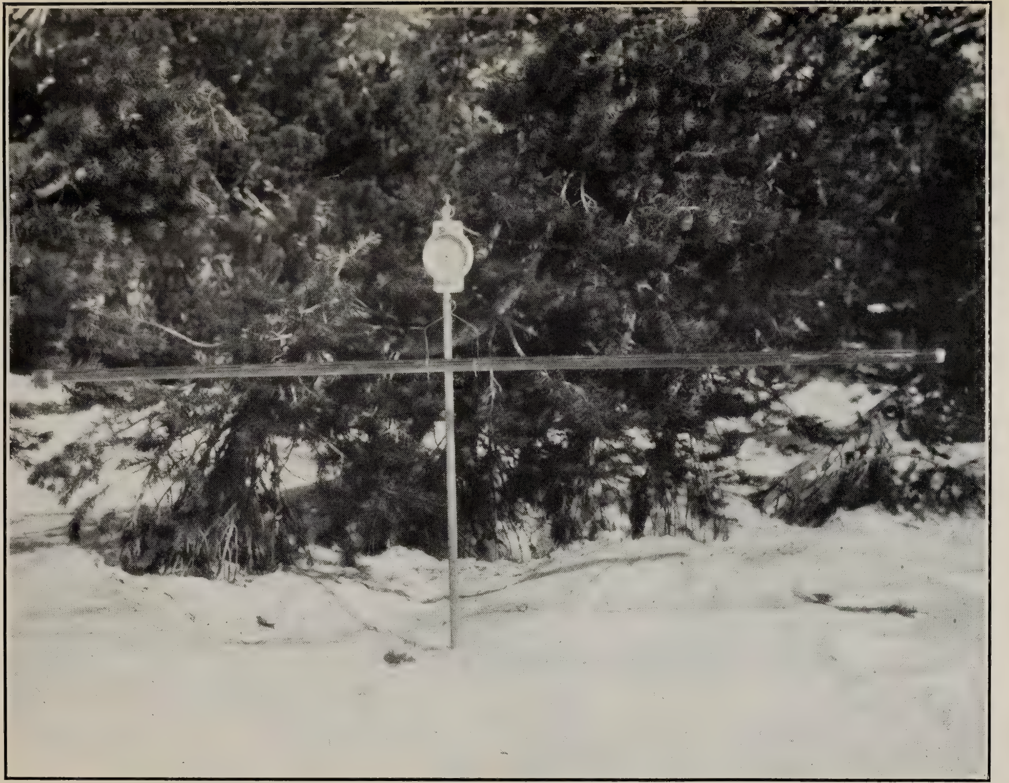
*"Conflicting Interests," page 70.



Meteorograph: records temperature, humidity, barometric pressure, precipitation, force and direction of wind.

PLATE XXVIII.



Snow surveying instruments.

Snow surveyor in costume.

The department holds, and has so pointed out in previous reports, that surveys of these great snow-field reservoirs should be made and the water content ascertained. From the information obtained, a forecast can be made of the quantity of water that will come down when the snow melts. Such information will be valuable, not alone in directing the operation of filling artificial reservoirs, but in giving foreknowledge of the summer flow, so that the farmer may conduct his irrigation to meet conditions. If it is known at planting time that there will be a shortage of water in June and July, crops will be planted which will not need water at that time and the limited quantity will be saved to mature fruit or other products requiring late application.

To make the prediction reliable, it is necessary to know something of the meteorological conditions prevailing before and at the time the snow was deposited. It is essential to know whether the ground was dry or saturated; whether it was warm or frozen, and many other meteorological phenomena which affect the melting of the snow.

A comprehensive snow survey then requires the use of instruments for recording precipitation, temperature, humidity and wind, as well as the water content of the snow. In the latter connection, it should be remarked that the mere measuring of snow gives no information of value. A foot of snow at one time may produce nearly a foot of water and at other times (and conditions) ten feet of snow are required for one foot of water.

The apparatus used in the determination and studies are several, and most of them must be self-recording.

A meteorograph set up and running requires attention only once a week (or longer, according to its construction), when the record-sheet must be changed. It contains a rain gage, thermometer, hygrometer and anemometer, each of which makes a continuous record upon one sheet of the precipitation, temperature, humidity, and the force and direction of the wind. The whole apparatus is enclosed in a shelter-house about four feet square.

A snow-sampler consists of a light jointed metal tube, with a cutter at one end for penetrating ice or compact snow, a scale with supporting staff to weigh the sample of snow.

To conduct a snow survey, a meteorograph, or better, more than one, if available, is set up in the field before the snows begin to fall. Regular visits are made to inspect and adjust the apparatus and change the record-sheet. After the last snowfall, and before spring thawing has set in, the snow is measured. Courses are laid out in selected portions of the field where average conditions prevail. With the tube a sample of snow from surface to bottom is taken and the amount of water it contains is found by weighing. The scale is graduated to read direct the inches in depth of water the column of snow will produce.

By taking a great many samples on a course and having many courses laid out, distributed well over the field, a close estimate is made of the quantity of water held in storage in that field. With the result of the samplings and the knowledge gained from the meteorograph records, a fairly accurate prognosis of the progress of melting snow and resulting water flow may be made.

It is only recently that meteorologists have taken up the study of snow in its relations to the precipitation of water it represents. They have been content with reporting the depth of snow from time to time and assuming that it represents a certain amount of water.

Professor J. E. Church, Jr., of the University of Nevada, has probably given more scientific study to the subject than any other man in the United States, if not in the world. From a pure regard of the scientific aspect, and a love of nature which finds delight in communing with her in all her moods, Professor Church has prosecuted his investigations for some years, mostly alone, but more recently in co-operation with the local representatives of the U. S. Reclamation Service and the U. S. Weather Bureau.

Although convinced that the study of snowfall in its relation to stream flow is of great importance and that it is one of its proper functions, the Department of Engineering has heretofore had neither apparatus nor funds with which to make the investigations.

The legislature two years ago authorized the department to engage in this line of research, but the act did not become effective in time to do anything last winter. Upon taking up the subject, it was found that some of the instruments required are not made by any manufacturer and can only be obtained by having them made to order. Under war conditions, it was found impossible to have this done.

Fortunately, however, through the good offices of Professor Church, the department has secured enough apparatus (and practically all there is in the United States), to enable investigations to be made upon the headwaters of about seven of the principal streams of the Sierras, four of which run into the Sacramento and San Joaquin valleys, and three into the irrigated districts of Nevada.

Tentative agreements have been made for the co-operation of the United States Forest Service, U. S. Weather Bureau and Reclamation officials, as well as of some large users of water in the territory named.

Professor Church has generously placed his knowledge and experience at the service of the department, and it is felt that it is engaging upon a line of research that will result in very great good.

TOPOGRAPHIC SURVEYS.

Under an agreement between the Director of the United States Geological Survey and the Department of Engineering, the co-operative topographic survey of the state has been prosecuted during the past two years as formerly. Although the war has greatly interfered with the work, 4068 square miles were mapped since the last report. Of this, 2660 square miles were in the coast counties and 1408 square miles in the San Joaquin Valley. The work was all done as special military surveys in co-operation with the War Department, after the declaration of war.

It will be remembered that the survey of the Sacramento Valley was completed some years ago and maps are being issued showing the topography in contours of five-foot intervals.

The same kind of work is being done in the San Joaquin Valley. The field work has extended into Fresno County and maps are published covering territory as far south as Berenda.

The co-operative topographic surveys have been conducted under the supervision of Mr. Geo. R. Davis, geographer in charge of the Pacific Division, directed by Colonel R. B. Marshall, chief geographer, U. S. Geological Survey.

Their report in detail for the biennium ending June 30, 1918, here follows:

REPORT OF TOPOGRAPHIC SURVEYS IN CO-OPERATION BETWEEN THE UNITED STATES GEOLOGICAL SURVEY AND THE STATE OF CALIFORNIA, FOR THE FISCAL YEARS BEGINNING JULY 1, 1916, AND ENDING JUNE 30, 1918.

In accordance with the co-operative agreements signed July, 1916, and July, 1917, by George Otis Smith, Director, for the United States Geological Survey, and W. F. McClure, State Engineer for the state of California, the federal survey allotted $14,000 each year, and the state an equal amount, for co-operative topographic surveys in the state of California for the fiscal year ending June 30, 1917, and June 30, 1918.

The following is a summary of the field and office work accomplished during the above period under the general direction of Colonel R. B. Marshall, chief geographer, and under the immediate supervision of George R. Davis, geographer in charge of the Western Division.

From March 26, 1917, all topographic surveys in California were special military surveys in co-operation with the War Department.

FIELD WORK.

Quadrangles	Counties	Publication scale	Area mapped. sq. m.	Primary levels: Miles	Primary levels: Permanent marks	Secondary traverse, miles	Triangulation: Stations occupied	Triangulation: Stations marked
San Luis Creek	Merced	1:31,680	60	-----	-----	57	14	4
Plainsberg	Merced, Madera	1:31,680	25	-----	-----	25	-----	-----
Lingard	Merced, Madera	1:31,680	60	-----	-----	-----	-----	-----
Las Garzas Creek	Merced, Stanislaus	1:31,680	7	-----	-----	-----	-----	-----
Bliss Ranch	Merced, Madera	1:31,680	60	-----	-----	-----	-----	-----
Chowchilla	Merced, Madera	1:31,680	59	-----	-----	-----	-----	-----
Volta	Merced	1:31,680	60	-----	-----	14	-----	-----
Berenda	Madera	1:31,680	59	-----	-----	-----	-----	-----
Los Banos	Merced	1:31,680	60	-----	-----	86	-----	-----
Sandy Mush	Merced	1:31,680	60	-----	-----	-----	-----	-----
Kismet	Madera	1:31,680	60	-----	-----	-----	-----	-----
Turner Ranch	Merced	1:31,680	60	-----	-----	-----	-----	-----
Elgin	Merced	1:31,680	60	-----	-----	-----	-----	-----
Daulton	Madera	1:31,680	70	-----	-----	-----	-----	-----
No. 10	Merced, Fresno, Madera	1:31,680	60	-----	-----	62	-----	-----
San Luis Ranch	Merced	1:31,680	60	-----	-----	-----	-----	-----
Herndon	Madera, Fresno	1:31,680	2	-----	-----	-----	-----	-----
Friant	Madera, Fresno	1:31,680	6	-----	-----	-----	-----	-----
Kings River	Fresno	1:31,680	8	-----	-----	-----	-----	-----
No. 21	Madera, Fresno	1:31,680	6	-----	-----	-----	-----	-----
Wahtoke	Fresno	1:31,680	8	9	2	-----	-----	-----
Sanger	Fresno	1:31,680	7	8	1	-----	-----	-----
Bridge	Madera, Fresno	1:31,680	6	-----	-----	-----	-----	-----
Indian Gulch	Mariposa	1:62,500	147	-----	-----	-----	-----	-----
Gilroy Hot Springs	Santa Clara, Stanislaus	1:62,500	238	55	9	150	-----	-----
Crevison Peak	Santa Clara, Stanislaus, Merced	1:62,500	118	20	4	44	-----	-----
Crows Landing	Stanislaus, Merced	1:62,500	82	-----	-----	45	-----	-----
Pozo	San Luis Obispo	1:62,500	83	46	-----	137	-----	-----
Jamesburg	Monterey	1:62,500	77	-----	-----	87	-----	-----
Lucia	Monterey	1:62,500	95	-----	-----	49	-----	-----
San Benito	Monterey, San Benito	1:62,500	240	31	9	-----	-----	-----
Gonzales	Monterey, San Benito	1:62,500	120	7	1	-----	-----	-----
Hollister	San Benito, Monterey, Santa Clara	1:62,500	218	48	16	120	-----	-----
Bonanza	San Benito, Santa Clara, Merced	1:62,500	239	21	5	-----	-----	-----
Mount Boardman	Santa Clara, Stanislaus	1:62,500	7	-----	-----	9	-----	-----
Adelaida	San Luis Obispo	1:62,500	234	25	-----	251	-----	-----
San Miguel	Monterey, San Luis Obispo	1:62,500	159	8	2	275	-----	-----
Bradley	Monterey, San Luis Obispo	1:62,500	242	-----	-----	239	-----	-----
Paso Robles	San Luis Obispo	1:62,500	242	17	-----	757	-----	-----
San Simeon	San Luis Obispo	1:62,500	48	16	-----	50	-----	-----
Gorda	San Luis Obispo, Monterey	1:62,500	160	-----	-----	-----	-----	-----
King City	Monterey	1:62,500	71	-----	-----	43	-----	-----
Junipero Serra	Monterey	1:62,500	173	-----	-----	63	-----	-----
Metz	Monterey, San Luis Obispo	1:62,500	10	-----	-----	-----	-----	-----
Bryson	Monterey, San Luis Obispo	1:62,500	142	9	-----	145	-----	-----
Totals	-----	-----	4,068	320	49	2,708	14	4

The following men were engaged in the field work:

Topographic Mapping.

Capt. J. P. Harrison.
Capt. E. G. Hamilton.
Capt. Wm. Stranahan.
Capt. E. H. Wilcox.
First Lieut. L. H. Connely.
First Lieut. R. T. Evans.
First Lieut. T. S. Marlor.
First Lieut. Roscoe Reeves.
Second Lieut. N. E. Ballmer.
Second Lieut. W. G. Carson.
Second Lieut. C. D. Curry.
Second Lieut. C. A. Ecklund.
Second Lieut. R. A. Furrow.
Second Lieut. N. A. Huth.
Second Lieut. E. N. Murphy.
Second Lieut. C. W. Rowell.
Second Lieut. T. P. Pendleton.
Second Lieut. R. C. Seitz.
Second Lieut. C. A. Stonesifer.
Second Lieut. K. W. Trimble.
Second Lieut. W. B. Upton, Jr.
Second Lieut. R. M. Wilson.
E. P. Davis, Topographic Engineer.
J. L. Lewis, Topographic Engineer.
S. G. Lunde, Topographer.
C. W. H. Nessler, Topographer.
J. H. LeFeaver, Assistant Topographer.
C. P. McKinley, Assistant Topographer.
G. M. Cunningham, Field Assistant.
E. Dolliver, Field Assistant.
R. A. Hamilton, Field Assistant.

Primary Levels.

Second Lieut. N. E. Ballmer.
Second Lieut. C. A. Ecklund.
Second Lieut. R. C. Seitz.
L. F. Biggs, Topographer.

Triangulation.

L. F. Biggs, Topographer.

OFFICE WORK.

The office drafting of the Little Table Mountain, Berenda, Bliss Ranch, Lingard, Turner Ranch, Chowchilla, Sandy Mush, Plainsberg, Sulphur Springs, Le Grand, Raynor Creek, Indian Gulch, Kings River, La Grange, Ingomar, Kismet, San Luis Ranch, Merced Falls, Haystack Mountain, San Joaquin River, and San Miguel topographic maps were completed and the maps transmitted for engraving. Progress in the drafting of additional sheets was made as follows: Los Banos, 45 per cent; Bradley, 85 per cent; Bryson, 5 per cent; Daulton, 10 per cent; Elgin, 80 per cent; Gorda, 70 per cent; Jamesburg, 10 per cent; King City, 10 per cent; Junipero Serra, 10 per cent; Las Garzas Creek, 10 per cent; Metz, 85 per cent; No. 10, 80 per cent; San Benito, 10 per cent; San Luis Creek, 15 per cent; San Miguel, 80 per cent; San Simeon, 30 per cent; and Volta, 80 per cent.

Primary level circuits were adjusted for the following quadrangles: Arroyo Grande, Cayucos, Jamesburg, Los Banos, Paso Robles, Sanger, San Miguel, Wahtoke, Adelaida, Bradley, Bryson, Cholame, San Simeon, and Valleton.

Geographic positions were computed for the following quadrangles: Jamesburg, Lucia, Metz, King City, Bradley, San Miguel, Bryson, San Simeon, Paynes Creek, Burney, Dixie, Prattville, Los Banos, Laguna Seca Ranch, No. 15, Elgin, No. 18, Mendota, No. 10, Sheep Ranch, No. 19, Center School, Firebaugh, Jamison, Dos Palos, No. 23, Kerman, Oxalis, Chaney Ranch, Carrisalito Springs and Tranquillity.

A SCENIC HIGHWAY.

The John Muir Trail.

John Muir was a geologist of more than national reputation and an accepted authority on glaciers and glacial action. His writings descriptive of world building, as recorded in the granites of the mountains, has done more than any other agency to call attention to the incomparable scenic beauties of the High Sierras.

In recognition of his services in making known these wonderful playgrounds of the gods, the legislature of 1915 provided for the construction of a safe trail extending along the axis of the Sierras from Mount Whitney to Yosemite Valley, and confided to the department the task of building it.

Although the appropriation made for it was inadequate to accomplish all that was desired, by enlisting the co-operation of the United States Forestry Service, and the Sierra Club, a fairly serviceable path was constructed, under the direction of the State Engineer, as stated in the last report of this department.

During 1917 the work was continued, particular attention being given to bridges and the improvement of bad stretches of trail. Owing to conditions due to the war, it was considered not advisable to attempt construction work during the year just closing.

All work of location and construction has been done under the direct charge of Forestry Service officials, to whom credit is due, particularly to Forest Supervisor W. A. Benedict, Deputy Supervisor Jordan, and Ranger John M. Hughes.

APPENDIX A.

Expenditure on Appropriations July 1, 1916, to June 30, 1918.

NOTE.—These accounts closed on, and transferred to California Highway Commission, July 27, 1917.

Chapter	Name of job	Balance, July 1, 1916	Expended	Balance, July 27, 1917
	STATE ROADS (Motor Vehicle Fund.)			
	Office expenses	$11,446 53		
	Add credit	125 00		
		$11,571 53		
	Deduct amounts transferred to other roads	1,911 53		
	Total	$9,660 00	$9,620 47	$39 53
	Alpine State Highway	$20,454 46		
	Add credits	31,718 66		
		$52,173 12		
	Deduct transfers to other roads	1,750 00		
	Total	$50,423 12	44,294 51	6,128 61
	Auburn-Emigrant Gap Road	$7,436 68		
	Add credits	23,929 55		
	Total	$31,366 23	30,552 77	813 46
	California Redwood Park Road	$4,776 22		
	Add credits	6,500 00		
	Total	$11,276 22	10,762 03	514 19
	Donner Lake Road	$10,348 12		
	Add credits	18,500 00		
	Total	$28,848 12	23,415 27	5,432 85
	Emigrant Gap Road	$10,397 20		
	Add credits	12,000 00		
	Total	$22,397 20	16,143 14	6,254 06
	Kings River Road	$3,001 66		
	Add credits	2,000 00		
	Total	$5,001 66	4,204 23	797 43
	Lake Tahoe Road	$10,501 07		
	Add credits	30,300 00		
	Total	$40,801 07	38,395 53	2,405 54
	Lassen Road	$4,269 07		
	Deduct transfer to Alpine Road	700 00		
	Total	$3,569 07	1,721 31	1,847 76
	Meyers-McKinneys Road	$7,607 29		
	Add credits	24,400 00		
	Total	$32,007 29	24,446 62	7,560 67
	Mono Lake Basin Road	$9,196 07		
	Add credits	16,000 00		
	Total	$25,196 07	18,108 03	7,088 04
	Sonora and Mono Road	$4,382 55		
	Add credits	8,200 00		
	Total	$12,582 55	9,477 89	3,104 66

APPENDIX A—Continued.

Expenditure on Appropriations July 1, 1916, to June 30, 1918.

Chapter	Name of job	Balance, July 1, 1916	Expended	Balance, July 27, 1917
	Trinity and Humboldt Road	$2,357 48		
	Add credits	11,700 00		
	Total	$14,057 48	$13,801 04	$256 44
	Tahoe City-Crystal Bay Road	$6,000 00	5,894 73	105 27
	Tioga Road	$11,337 85		
	Add credits	25,000 00		
	Total	$36,337 85	34,067 15	2,270 70
	STATE ROADS (Special Appropriation).			
678, 1915	Auburn-Emigrant Gap Road	$468,43	468 43	
120, 1913	Alpine Road	3 89	3 89	
468, 1911	Alpine Road	2 42		
468, 1911	Add credits	2 87		
	Total	$5 29	2 42	2 87
398, 1913	California Redwood Park Road	$16 77	16 77	
619, 1913	Emigrant Gap Road	1 13	1 13	
502, 1911	Kings River Road	1 80	1 80	
117, 1913	Lake Tahoe Road	2 89	2 89	
334, 1911	Lake Tahoe Road	2 78	2 78	
762, 1915	Lake Tahoe Road	6,884 55	4,061 42	2,823 13
498, 1911	Lassen Road	136 96	12 95	124 01
764, 1915	Pescadero and Redwood Park Road	10,000 00	9,601 90	398 10
765, 1915	Surprise Valley Road	235 58	164 86	70 72
680, 1915	Tahoe City-Crystal Bay Road	$3,000 00		
	Add credit	3,000 00		
	Total	$6,000 00	5,990 66	9 34
283, 1915	Yolo and Lake Road	$940 58	2 63	937 95

APPENDIX A—Continued.

Expenditure on Appropriations July 1, 1916, to June 30, 1918.

Chapter	Name of job	Balance, July 1, 1916, and appropriations	Expended	Balance, July 27, 1918
	Rivers.			
465, 1913	Rectifying river channels	$69,303 17	$69,303 17	
664, 1915	Rectifying river channels, available 7/1/16	100,000 00	100,000 00	
377, 1917	Rectifying river channels, available 7/27/17	50.000 00	10,417 38	$39,582 62
697, 1915	San Rafael deep water channels (maintaining navigability)	12,500 00	--------------	12,500 00
25, 1911	Sacramento River flood control	29 86	--------------	29 86
503, 1909	Humboldt Bay survey	499 46	--------------	499 46
526, 1911	Mad River bank protection	7,217 41	1,937 29	5,280 12
14, 1901	Restraining debris	42,336 38	267 47	42,068 91
742, 1911	Canals and canalization of rivers	3 47	--------------	3 47
502, 1911	Eel River bank protection	50	--------------	50
	Agricultural Park.			
443, 1913	Barns, sheds and poultry buildings	8,825 18	8,328 10	497 08
534, 1911	Dairy buildings and barns	176 43	--------------	176 43
512, 1913	Drainage and sewers	3,456 32	3,444 93	11 39
532, 1911	Grandstand	64 22	48 00	16 22
71, 1909	Machinery Hall	393 63	372 61	21 02
531, 1911	Manufactures Pavilion	564 12	294 79	269 33
533, 1911	Infield walks and improvements	189 82	--------------	189 82
221, 1915	Construction and repairs, barns and sheds	4,555 12	4,482 54	72 58
202, 1915	Women's Building	18,487 86	18,454 29	33 57
281, 1917	Improvement to grounds and erection of barns	8,500 00	8,302 12	197 88
280, 1917	Construction and repairs to buildings	5,000 00	1,697 36	3,302 64
358, 1917	Temporary pavilion	4,110 27	4,110 27	
358, 1917	Repairs to Manufactures Building	1,025 00	1,025 00	
775, 1917	Construction Agricultural Pavilion	300,000 00	33,233 75	266,766 25
Cont. 5949, 5127	Sewer, water, spur track	1,966 43	1,206 73	759 70
	Armories.			
468, 1913	Armory, Los Angeles	2,982 45	2,433 73	548 72
469, 1913	Armory, Sacramento	1,410 45	415 05	995 40
549, 1913	Armory, San Francisco	1,556 42	1,556 42	
258, 1915	Armory, Naval Militia, San Diego	328 51	22 33	306 18
310, 1917	Armory, Naval Militia, San Diego	800 00	--------------	800 00
321, 1915	Armory, Stockton	22,680 85	22,574 83	106 02
	Schools.			
	California Polytechnic.			
315, 1917	Construction of barn	4,000 00	--------------	4,000 00
511, 1909	Construction of barns	24 22	24 00	22
207, 1911	Dining hall	184 14	87 50	96 64
271, 1911	Heating system	4 81	--------------	4 81
493, 1913	Heating system	10 00	--------------	10 00
270, 1911	Power, heat and light	10 21	10 00	21
291, 1915	Repairs to building and equipment	60 98	11 88	49 10
548, 1911	Repairs and improvements	2 63	--------------	2 63
492, 1913	Repairs to buildings	143 62	--------------	143 62
471, 1917	Repairs to buildings	5,000 00	4,828 39	171 61
760, 1917	Water supply	55,000 00	55,000 00	
102, 1913	Water system	293 46	--------------	293 46
290, 1915	Water supply	15.040 16	3,902 63	11,137 53
228, 1911	Water and sewer system	23 19	22 00	1 19
	Chico State Normal.			
173, 1913	Repairs and additions to heating system	79 07	--------------	79 07
224, 1915	Repairs and improvements	1,145 42	1,089 69	55 73
460, 1913	Repairs and alterations	304 06	303 30	76
282, 1917	Additions to training building	16,000 00	7,945 84	8,054 16
459, 1913	Water supply	116 95	90 56	26 39
136, 1911	Passageway	25 31	--------------	25 31
536, 1913	Street work	75 70	--------------	75 70

APPENDIX A—Continued.

Expenditure on Appropriations July 1, 1916, to June 30, 1918.

Chapter	Name of job	Balance, July 1, 1916, and appropriations	Expended	Balance, July 27, 1918
	SCHOOLS—Continued. *Fresno Normal.*			
207, 1915	Grounds	$6,404 89	$5,988 71	$416 18
504, 1911	Grounds	3,993 19	2,416 22	1,576 97
240, 1917	Completion of plant and equipment	17,000 00	11,709 29	5,290 71
171, 1913	Temporary buildings	101 12	--------------	101 12
393, 1915	Water supply	3,581 60	3,581 60	
393, 1915	Furnishings	1,674 00	1,674 00	
393, 1915	Clock system	943 60	830 55	113 05
516, 1913	Building and equipment	48,726 33	48,689 92	36 41
303, 1917	To pay claims of contractors	55,000 00	47,388 96	7,611 04
	Humboldt State Normal.			
204, 1915	Construction and equipment	89 55	85 13	4 42
743, 1917	General improvements	230,000 00	10,059 52	219,940 48
237, 1917	Painting temporary buildings	1,000 00	999 61	39
742, 1917	Equipment and furnishing	14,000 00	--------------	14,000 00
	Los Angeles State Normal.			
335, 1917	Additions to buildings	14,800 00	10,290 01	4,509 99
332, 1915	Addition to manual training building	126 51	124 20	2 31
416, 1911	Building and improvement fund	12 01	8 69	3 32
504, 1913	Bleacher and playground equipment	196 95	--------------	196 95
340, 1917	Improvement to grounds	10.000 00	250 00	9,750 00
334, 1917	Repairs to buildings and equipment	3,000 00	2,581 69	418 31
	Preston School of Industry.			
156, 1909	Two cottages	581 95	--------------	581 95
172, 1913	Cottages	12,999 75	12,622 51	377 24
529, 1913	Hospital	11,188 42	443 43	10,744 99
549, 1911	Concrete floor	702 43	--------------	702 43
301, 1915	Repairs	14,875 55	13,753 14	1,122 41
680, 1911	Repairs	26 79	25 75	1 04
411, 1917	Repairs and improvement	10,000 00	3,674 52	6,325 48
522, 1909	Pipe line	2 21	--------------	2 21
531, 1913	Addition to trades building	10,616 40	--------------	10,616 40
195, 1911	Water system	555 26	--------------	555 26
206, 1911	Water power plant	6 33	--------------	6 33
Cont. 3856	Club house	1,400 00	1,396 31	3 69
	San Diego State Normal.			
246, 1917	Improvements to grounds	5,500 00	5,252 78	247 22
236, 1915	Grounds	185 89	185 88	01
491, 1913	Improvement to grounds	3 35	3 25	10
524, 1911	Heating plant	18 99	--------------	18 99
308, 1917	Paving	1,500 00	30 44	1,469 56
333, 1917	Repairs and improvements	7,000 00	6,702 82	297 18
234, 1915	Repairs and improvements	236 79	236 33	46
490, 1913	Repairs	15 05	14 94	11
	San Francisco State Normal.			
491, 1917	Buildings	450,000 00	--------------	450,000 00
123, 1911	Repairs	22 63	22 61	02
421, 1913	Repairs and furnishing	31 05	31 05	
225, 1915	Remodeling buildings	209 52	183 62	25 90
Cont. 1302	Repairs	1,978 66	1,977 09	1 57
	San Jose State Normal.			
219, 1915	Outdoor classrooms	3,356 58	3,296 20	60 38
463, 1913	Gymnasium and playgrounds	13 22	--------------	13 22
426, 1913	Repairs	185 54	--------------	185 54
258, 1917	Assembly hall	80,000 00	784 46	79,215 54
243, 1915	Street improvements	9,670 87	297 45	9,373 42
193, 1911	Grounds	138 43	--------------	138 43

APPENDIX A—Continued.

Expenditure on Appropriations July 1, 1916, to June 30, 1918.

Chapter	Name of job	Balance, July 1, 1916, and appropriations	Expended	Balance, July 27, 1918
	SCHOOLS—Continued.			
	Santa Barbara State Normal.			
295, 1915	Grounds	$10 35	$10 33	$0 02
257, 1917	Gymnasium	20,000 00	8,240 65	11,759 35
299, 1915	Machinery building	1,109 38	1,087 74	21 64
294, 1915	Repairs	519 20	487 63	31 57
546, 1911	Main building	8 56	-------------	8 56
547, 1911	Lunch room	3 73	3 17	56
250, 1917	Sewer system	1,000 00	979 97	20 03
412, 1917	Street improvement	6,000 00	6,000 00	
	California School for Girls.			
362, 1917	Trades building and gymnasium	30,000 00	359 15	29,640 85
367, 1917	Cottages	63,000 00	634 31	62,365 69
365, 1917	Heating system	1,200 00	990 66	209 34
366, 1917	Improvement of grounds	4,000 00	2,770 86	1,229 14
361, 1917	Ice plant	2,000 00	1,742 85	257 15
364, 1917	Service connections	6.000 00	-------------	6.000 00
474, 1917	Water system	10,000 00	33 95	9,966 05
239, 1915	Commissary building	1,432 52	1,286 56	145 96
318, 1915	Two cottages	5.188 91	5,184 16	4 75
241, 1915	Cottage for males	1,064 22	1,060 69	3 53
262, 1915	Drains	136 25	133 93	2 32
240, 1915	Farm buildings	1,736 16	1,688 02	48 14
319, 1915	Garage	628 32	604 73	23 59
320, 1915	Grounds	2,017 64	1,984 83	32 81
401, 1913	Construction and equipment	4,019 18	3,403 15	616 03
Cont. 2604	Water system	500 00	500 00	
	Whittier State School.			
356, 1917	Buildings	82.500 00	46,263 79	36,236 21
238, 1915	Cottages	58,304 99	58,235 63	69 36
163, 1911	Cottages	1,536 99	1,536 99	
233, 1911	Dairy barn	13 20	-------------	13 20
355, 1917	Power house	25.000 00	887 84	24,112 16
359, 1917	General repairs and improvements	2,755 00	2,715 69	39 31
357, 1917	Alterations and construction	45,000 00	22,795 59	22,204 41
427, 1913	Repairs	662 43	662 43	
317, 1915	General repairs and improvements	1,395 60	1,392 45	3 15
232, 1911	Repiping	1 23	1 23	
Cont. 1408	Water system	458 55	458 55	
Cont.	General repairs	10 20	10 20	
	HOMES.			
	California School for Deaf and Blind.			
440, 1913	Gymnasium	1,361 69	1,130 55	231 14
655, 1911	Manual industrial arts building	428 52	158 46	270 06
247, 1915	Repairs and improvements	505 87	504 59	1 28
442, 1913	Dairy barn	309 83	292 30	17 53
249, 1915	Fire escapes	1,500 00	1,474 30	25 70
248, 1915	Electric wiring	10,667 27	10,637 17	30 10
294, 1917	Electric wiring	5,000 00	4,971 82	28 18
277, 1915	Heating system	24,448 32	24,311 57	136 75
293, 1917	Heating system	21,000 00	15,545 78	5,454 22
514, 1913	Repairs and improvements	196 21	152 42	43 79
251, 1915	Repairs and improvements	496 26	489 95	6 31
348, 1917	Repairs and improvements	20,000 00	14,012 51	5,987 49
250, 1915	Development of wells	3,980 00	3,635 04	344 96
569, 1909	Plumbing, etc.	2 64	-------------	2 64
523, 1911	Water supply	8 80	-------------	8 80
	Industrial Home of Mechanical Trades for the Adult Blind, Oakland.			
418, 1913	Dormitory	971 50	659 67	311 83
419, 1913	Floors	102 68	-------------	102 68
245, 1915	Repairs	908 03	903 38	4 65
288, 1917	Improvement grounds	460 00	440 96	19 04
292, 1917	Repairs and improvements	8,700 00	8,485 46	214 54
289, 1917	Water supply	4,250 00	2,998 47	1,251 53

APPENDIX A—Continued.

Expenditure on Appropriations July 1, 1916, to June 30, 1918.

Chapter	Name of job	Balance, July 1, 1916, and appropriations	Expended	Balance, July 27, 1918
	HOMES—Continued.			
	Sonoma State Home.			
508, 1913	Cottage for epileptics	$46 78	$36 48	$10 30
509, 1913	Building for farm hands	156 55		156 55
208, 1915	Barracks	8,522 93	8,521 65	1 28
209, 1915	Improvement grounds	1,430 23	1,429 95	28
297, 1915	Water and steam piping and plumbing	16,248 11	16,240 13	7 98
434, 1913	Septic tanks	41 09	39 31	1 78
264, 1917	Cottage	15,000 00	6,166 56	8,833 44
353, 1917	Reconstruction Madrone Hall for commissary	5,000 00		5.000 00
435, 1913	Dormitory	58 34	48 30	10 04
255, 1917	Bakery building	15.000 00	423 53	14,576 47
256. 1917	Laundry building	22.500 00	500 26	21,999 74
436, 1913	Nursery for males	133 23		133 23
296, 1915	Nursery for girls	20,079 41	19,843 12	236 29
568, 1909	Power house and boiler	52 66	24 40	28 26
519, 1911	Reflooring	559 88	497 00	62 88
352, 1917	Reflooring	4,000 00	2,617 94	1,382 06
448, 1909	Repairs, Manor House	18 73	13 75	4 98
239, 1911	Water supply	27 60	27 46	14
433, 1913	Water supply	5,107 05	4,109 51	997 54
351, 1917	Steam pipe extension	8,100 00	8,035 27	64 73
	Sonoma State Home Contingent Fund—			
Est. #647	Cannery building	298 02	261 06	*36 96
Est. #1121	Tubercular hospital	3,358 64	3,306 60	*52 04
Est. #1124	Plans for development of grounds	197 52	189 02	8 50
Est. #7126, 7127	Reconstruction of barracks	5,000 00	4,989 86	10 14
Emerg. Fund, Chap. 393, 1915	Reconstruction of barracks	3,500 00	3,316 87	183 13
Cont. est. #778	Water purifier and storage tank	475 04	463 94	11 10
	Veterans' Home.			
214, 1915	Bath rooms in barracks	10,421 92	10,357 93	63 99
511, 1911	Cottage C	98 25		
511, 1911	Cottage C—credit	4 55		
		102 80	1 43	101 37
483, 1913	Dairy barn	43 09		43 09
410, 1913	Painting	36 33	30 00	6 33
482, 1913	Plumbing	990 51	987 03	3 48
213, 1915	Repairs	10,558 03	10,332 22	225 81
483, 1913	Assembly hall	176 63	81 05	95 57
212, 1915	Ten cottages	21,334 08	21,333 98	10
252, 1909	Distilling water	79 82	26 85	52 97
216, 1915	Electric wiring	3,484 88	3,434 73	50 15
236, 1911	Fire escapes	255 63		255 63
508, 1911	Grounds	102 91		102 91
486, 1909	Addition to hospital	90		90
409, 1913	Lavatories	24 65		24 65
470, 1913	Pipe line	397 43		397 43
507, 1911	Plumbing	782 89	770 26	12 63
215, 1915	Plumbing and repairs	8,139 01	3,569 70	4,569 31
508, 1909	Repairs to buildings	9 59		9 59
235, 1911	Cold storage	31 71	10 00	21 71
411, 1913	Repairs to buildings	76 75		76 75
509, 1911	Repairs to buildings	82		82
488, 1909	Storehouse and commissary	108 20		108 20
521, 1911	Septic tanks	875 34	37 60	837 74
510, 1911	Surgeon's residence	66 07		66 07
483, 1917	Boilers	15,000 00		15,000 00
395, 1917	Chapel	5,000 00	4,185 55	814 45
391, 1917	Electric wiring	2,500 00	1,014 88	1,485 12
394, 1917	Quarters for inebriates	8,000 00	3,991 82	4,008 18
426, 1917	Kitchen, etc.	4,000 00	1,306 80	2,693 20
244, 1917	Painting buildings	7,500 00		7,500 00
392, 1917	Plumbing	2,500 00		2,500 00
263, 1917	Repairs and improvements	15,000 00	6,094 62	8,905 38
243, 1917	Tubercular ward	10.000 00	3,469 32	6,530 68

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*Returned to Contingent Fund, Sonoma State Home.

APPENDIX A—Continued.

Expenditure on Appropriations July 1, 1916, to June 30, 1918.

Chapter	Name of job	Balance, July 1, 1916, and appropriations	Expended	Balance, July 27, 1918
	Women's Relief Corps Home.			
248, 1917	Repairs and improvements	$5,000 00	$3,717 21	$1,282 79
	HOSPITALS.			
	Agnews State Hospital.			
400, 1913	Workers' cottage	6,521 73	1,072 60	5,449 13
473, 1913	Nurses' home	2,255 51	343 24	1,912 27
606, 1913	Wiring and steam line	38 34	------	38 34
307, 1917	Cottage "M"	27,000 00	1,660 20	25,339 80
332, 1917	Workers' cottage for men	45,000 00	2,685 07	42,314 93
754, 1915	Patients' cottage	22,270 52	21,984 77	285 75
Est. #689	Contingent clock system	7,637 70	7,392 83	244 87
Est. #5754	Contingent drafting	500 00	500 00	
Est. #6100	Contingent repairs, gas plant, etc.	3,100 00	2,645 08	454 92
Est. #7315	Contingent well	2,000 00	1,927 57	72 43
Est. #9360	Contingent electric transformers	1,500 00	1,463 23	36 77
Est. #10354	Contingent pumping plant	1,750 00	1,749 05	95
	Mendocino State Hospital.			
107, 1913	Dam and reservoir	3,042 91	------	3,042 91
125, 1911	Male cottage	258 22	------	258 22
481, 1913	Gas plant	3 90	------	3 90
220, 1915	Elevators	7,402 44	7,399 07	3 37
192, 1915	Pipe line	9,235 71	8,543 26	692 45
305, 1915	Plumbing repairs	4,769 19	4,736 83	32 36
Cont. est.#7296	Alterations, administration building	6,375 00	6,048 78	*326 22
Cont. est.#669	Addition to kitchen	8,089 46	7,947 42	*142 04
Cont. est. #670	Steward's residence	575 89	551 94	*23 95
Cont. est.#985	Pipe lines, etc.	1,458 86	1,310 07	*148 79
Cont. est.#891	Manager's cottage	2,501 54	2,484 15	*17 39
Cont. est.#3049	Pipe lines from power house to buildings	1,500 00	1,422 75	*77 25
Cont. est.#5825	Remodeling superintendent's residence	4,500 00	4,491 00	*9 00
Cont. est.#6107	Repairs to plumbing	750 00	738 80	*11 20
Cont. est.#984	Survey and map for plumbing and steam lines	250 00	127 31	*122 69
Cont. est.#986	Concrete conduit	538 27	523 43	*14 84
Cont. est.#1053	Inspection proposed construction	545 00	539 34	*5 66
Cont. est.#5640	Water supply	6,900 00	78 99	6,821 01
Cont. est.#1058	Electrical work	8,019 46	5,844 25	2,175 21
267, 1917	Water softening	7,500 00	74 64	7,425 36
268, 1917	Reconstruction Ward No. 7	5,000 00	310 35	4,689 65
269, 1917	Repairs, floors	2,500 00	1,814 81	685 19
325, 1917	Plumbing repairs	5,000 00	232 46	4,767 54
296, 1917	Laundry and bakery	18,000 00	16,417 30	1,582 70
326, 1917	Enlarging operating rooms	3,000 00	------	3,000 00
327, 1917	Reconstruction Ward No. 10	20,000 00	11,547 59	8,452 41
370, 1917	New boilers	18,000 00	6,858 17	11,141 83
371, 1917	Repairs, administration building	3,500 00	1,483 80	2,016 20
	Napa State Hospital.			
487, 1913	Dairy buildings	1,018 46	566 95	451 51
486, 1913	Dormitories and sheds	433 72	286 85	146 87
408, 1913	Credit material returned	4 31	------	152 70
	Heating system	148 39		
405, 1913	Laundry building	254 91	2 90	252 01
407, 1913	Cottages	2,574 35	2,314 01	260 34
489, 1909	Female cottage	319 48	------	319 48
505, 1911	Irrigation	4 54	------	4 54
314, 1909	Kitchen	51 99	------	51 99
404, 1913	North pay cottage	46 95	------	46 95
315, 1909	Receiving and treatment building	34 83	------	34 83
327, 1915	South pay cottage	11,072 76	11,072 24	52
488, 1913	Rewiring	73 72	------	73 72
489, 1913	Reclamation of low lands	780 16	709 12	71 04
352, 1915	Power house	4,461 65	4,428 56	33 09
325, 1915	Men patients' cottage	14,534 04	14,533 17	87
324, 1915	Women patients' cottage	13,388 17	13,231 75	156 42

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*Returned to Contingent Fund, Mendocino State Hospital.

APPENDIX A—Continued.

Expenditure on Appropriations July 1, 1916, to June 30, 1918.

Chapter	Name of job	Balance, July 1, 1916, and appropriations	Expended	Balance, July 27, 1918
	HOSPITALS—Continued. *Napa State Hospital*—Continued.			
326, 1915	Home for working men	$14,199 21	----------	$14,199 21
242, 1917	Pathological laboratory	20.000 00	$698 66	19.301 34
396, 1917	Laundry machinery	6,000 00	----------	6,000 00
397, 1917	Power house and machinery	6,000 00	5,076 65	923 35
398, 1917	Electric elevators	10,000 00	9,881 63	118 37
399, 1917	Sewer line	10,000 00	9,408 65	591 35
410, 1917	Reclamation and irrigation	6,000 00	2,756 12	3,243 88
241, 1917	Cottage for females	15,000 00	116 17	14,883 83
480, 1917	Two cottages	58,000 00	582 75	57,417 25
489, 1917	Water supply	75,000 00	47,915 46	27,084 54
503, 1911	Cold storage	49 99	----------	49 99
406, 1913	Boilers	29	----------	29
Cont. est.#998	Gas plant	1,200 00	1,194 19	*5 81
Cont. est.#1028	Bell tower	2,714 05	2,590 42	*123 63
Cont. est.#1027	Plans for alteration chapel	100 00	75 47	*24 53
Cont. est.#9767	Equipment for well	2,500 00	2,332 91	*167 09
Cont. est. #464	Remodeling bakery and kitchen	579 89	568 32	*11 57
Cont. est.#636	Bungalow for Dr. Ogden	663 55	639 92	*23 63
Cont. est.#783	Replace roof on laundry and survey of sewer lines	775 00	774 52	*48
Cont. est.#1267	Alterations assembly building and class rooms	5,935 00	5,935 00	
Cont. est.#2214	Power plant equipment	346 89	346 89	
Cont. est.#2928	Sewer line and heating conduit	850 00	846 94	*3 06
Cont. est.#6218	Conduit to south pay cottage	900 00	900 00	
Cont. est.#7634	Survey of pipe line	500 00	454 25	45 75
	Norwalk State Hospital.			
455, 1913	Buildings	979 81	648 95	330 83
287, 1915	Buildings	43,543 95	43,392 95	151 00
341, 1917	Bakery equipment	4,000 00	----------	4,000 00
343, 1917	Superintendent's cottage	10.000 00	1,405 17	8.594 83
344, 1917	Farm buildings	36,700 00	----------	36,700 00
345, 1917	Administration building	50,000 00	252 08	49,747 92
346, 1917	Three patients' cottages	135,000 00	20,843 85	114,156 15
	Southern California State Hospital.			
218, 1915	Two cottages	1,751 02	957 86	793 16
496, 1913	Laundry building	13 83	5 32	8 51
307, 1915	Water supply	7,776 84	7,719 03	57 81
336, 1917	Boilers	8,000 00	1 53	7,998 47
337, 1917	Rewiring	8,000 00	5,054 72	2,945 28
338, 1917	Cottage for disturbed patients	43,000 00	25,576 38	17,423 62
339, 1917	Pump and equipment for well	3.000 00	2,971 43	28 57
404, 1917	Nurses' home and industrial building	15,000 00	12,699 48	2,300 52
477, 1913	Four cottages	771 85	----------	771 85
461, 1909	Physician's residence	2 16	----------	2 16
462, 1909	Dining hall	244 27	----------	244 27
457, 1909	Female cottage No. 2	17 00	----------	17 00
459, 1909	Female cottage No. 3	50 90	----------	50 90
155, 1907	Dairy barns	135 10	----------	135 10
463, 1909	Two receiving cottages	65 64	----------	65 64
281, 1911	Power plant	107 70	----------	107 70
497, 1913	Reservoir	208 88	----------	208 88
458, 1909	Storm drains	274 71	----------	274 71
Cont. est.#1098	Chicken yards and equipment	3,500 00	3,488 76	11 24
Cont. est.#5110	Cottage No. 16	40,000 00	39,665 75	†334 25

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*Returned to Contingent Fund, Napa State Hospital.

†Returned to Southern California State Hospital Contingent Fund.

APPENDIX A—Continued.

Expenditure on Appropriations July 1, 1916, to June 30, 1918.

Chapter	Name of job	Balance, July 1, 1916, and appropriations	Expended	Balance, July 27, 1918
	HOSPITALS—Continued.			
	Stockton State Hospital.			
416, 1913	Ward No. 25	$426 22	$25 32	$400 90
309, 1915	Wiring	670 70	670 70	
792, 1917	Removal of bodies from cemetery and disposition thereof	5,000 00	31 67	4,968 33
272, 1917	Tubercular hospital	10,000 00	13 21	9,986 79
330, 1917	Cottage for disturbed patients	45,000 00	20 75	44,979 25
414, 1913	Elevators	86 09	-------------	86 09
127, 1911	Fire system	422 69	-------------	422 69
415, 1913	Heating system	83 21	-------------	83 21
197, 1911	Heating system	191 94	137 72	54 22
172, 1907	Receiving ward	18 84	-------------	18 84
126, 1911	Sewing room and dormitory	245 98	-------------	245 98
211, 1915	Boilers	1,129 92	885 33	244 59
210, 1915	Female building	22,654 50	22,088 01	566 49
310, 1915	Cottage for males	22,886 05	22,829 17	56 88
300, 1915	Farm buildings	1,826 21	1,068 99	757 22
350, 1915	Two physicians' cottages	6,358 85	6,358 85	
234, 1917	Repairs to mechanical equipment	8,000 00	7,792 96	207 04
235, 1917	Alterations to kitchen and bakery	8,550 00	8,308 22	241 78
Cont. est.#331	Repairs to steam and water supply systems	6,515 00	5,234 95	1,280 05
Cont. est.#2759	Stockton State Hospital Support Fund	700 00	654 22	45 78
	Pacific Colony.			
776, 1917	Pacific Colony for feeble-minded epileptics	250,000 00	-------------	250,000 00
	PRISONS.			
	Folsom State Prison.			
449, 1913	Cells and walls	5,301 97	822 04	4,479 93
447, 1913	Farm buildings	732 61	250 41	482 20
450, 1913	Laundry building	650 80	480 73	170 07
199, 1915	Cells, etc.	1,543 44	1,534 92	8 52
315, 1915	Power house	9.568 94	9,339 29	229 65
316, 1915	Repairs and improvements	10,122 54	10,115 51	7 03
573, 1909	Additional houses	1,347 75	1,209 11	138 64
448, 1913	Repairs	238 69	106 62	132 07
562, 1909	Warden's residence	238 78	22 15	216 63
273, 1915	Cells, etc.	16.502 32	16,448 82	53 50
313, 1915	Bake oven	5,000 00	3,427 39	1,572 61
311, 1915	Farm buildings	127 75	102 82	24 93
312, 1915	Refrigerator	4,093 85	3,819 53	274 32
254, 1917	Sewage disposal	11,000 00	9,755 76	1,244 24
276, 1917	School buildings	10,000 00	3,025 91	6,974 09
278, 1917	Repairs and improvements	25,000 00	8,718 48	16,281 52
279, 1917	Employees' cottage	10,000 00	9,147 01	852 99
279, 1917	Repairs, existing cottage	2,500 00	747 46	1,752 54
485, 1917	Boilers and power plant equipment	15,000 00	5,990 88	9,009 12
	San Quentin State Prison.			
562, 1911	Cells and walls	14,688 12	11,557 46	3,130 66
559, 1909	Guards' cottages	313 79	230 47	83 32
322, 1915	Repairs and improvements	136 41	136 41	
228, 1915	Water supply and pumping plant	4,476 37	364 54	4,111 83
253, 1917	Electrification, rewiring	3,500 00	3,400 33	99 67
233, 1917	Rewiring	32,500 00	22,802 93	9,697 07
284, 1917	Small buildings	18,500 00	8,257 37	10,242 63
285, 1917	Farm buildings	5,000 00	-------------	5,000 00

APPENDIX A—Continued.

Expenditure on Appropriations July 1, 1916, to June 30, 1918.

Chapter	Name of job	Balance, July 1, 1916, and appropriations	Expended	Balance, July 27, 1918
	MISCELLANEOUS.			
393, 1915	Department of Engineering contingent, sixty-seventh year	$1,971 02	$1,483 51	$487 51
393, 1915	Department of Engineering contingent, sixty-eighth year	17,500 00	15,393 71	2,106 29
358, 1917	Department of Engineering contingent, sixty-ninth year	22,500 00	15,319 50	7,180 50
	Sixth District Agricultural Association.			
223, 1915	Repairs, Exposition Building	2,980 62	2,856 85	*123 77
354, 1917	Enlarging furnace and repairs, elevator	3,125 00	1,172 85	1,952 15
354, 1917	Remodeling Exposition Building	17,000 00	5,102 86	11,897 14
	State Capitol.			
368, 1917	Painting	5,000 00	3,175 57	1,824 43
603, 1913	Painting	99 00	98 12	88
532, 1913	Conservatory	45 73	----	45 73
538, 1913	Elevators	39 85	5 00	34 85
358, 1917	Library elevator, emergency fund	3,000 00	2,500 00	500 00
263, 1915	State Treasurer's office equipment	523 53	522 05	1 48
430, 1917	Secretary of State's office, vault equipment	4,000 00	3,151 40	848 60
762, 1917	State Printing Office building	100,000 00	----	100,000 00
541, 1913	San Francisco State Building	$199,887 96		
541, 1913	San Francisco State Building	800,000 00	21,479 26	978,408 70
	Appropriation	$999,887 96		
193, 1915	Governor's residence, repairs	1 64	----	1 64
400, 1917	Marshall's monument	4,000 00	332 31	3,667 69
	Petroleum and Gas Fund.			
759, 1917	Office buildings at Taft	4,750 00	3,142 57	1,607 43
759, 1917	Office buildings at Coalinga	4,000 00	3,913 81	86 19
	Oil Protection Fund.			
718, 1915	Garage and test house, Taft	2,500 00	125 05	†2,374 95
	Fish and Game Preservation Fund.			
	Owens River fish hatchery	$27,165 20		
	Appropriated	29,500 00	56,459 41	205 79
		$56,665 20		
Est. #556	Patrol launch	15,910 00	15,857 81	52 19
322, 1917	Monterey Theater, repairs	3,500 00	3,499 52	48
321, 1917	Monterey custom house, repairs	5,500 00	4,948 60	551 40
311, 1917	Fort Ross, repairs to buildings	1,500 00	136 50	1,363 50
679, 1915	Fort Ross, repairs, Greek chapel	2,000 00	1,975 39	24 61
480, 1913	Mission Solano, Sonoma	952 36	35 75	916 61
693, 1915	Mission Solano, Sonoma	104 12	2 00	102 12
376, 1917	Fort Sutter, electric lighting	1,000 00	999 85	15

*Returned to Sixth District Agricultural Association Fund.
†Returned to Oil Protection Fund.

APPENDIX B.

(Reprinted from Report on Iron Canyon Project, U. S. Reclamation Service, October, 1914.)

REPORT ON THE IRON CANYON PROJECT BY THE BOARD OF REVIEW.

Secretary of the Interior Franklin K. Lane appointed a board to consider the foregoing investigation of the Iron Canyon project and to report thereon. This board included representatives of the various federal and state departments actively interested in this project and its dependent features.

Brigadier General W. L. Marshall, ex-Chief of Engineers U. S. Army, and consulting engineer to the Secretary of the Interior, was chairman. Other members were: State Engineer W. F. McClure, who is ex officio engineering adviser to the State Reclamation Board and the chief state administrative officer in matters of water control and irrigation; Mr. D. C. Henny, acting chief engineer of the U. S. Reclamation Service, and Mr. H. T. Cory, consulting engineer of San Francisco, who is in this case the special representative of individual and corporate interests that will be mainly affected by the project. The board reported as follows:

Red Bluff, Cal., November 12, 1914.

To the Secretary of the Interior, Washington, D. C.

Sir: This board was appointed by you and received instructions through the Director of the Reclamation Service as follows:

> "The duties of the board are to review the report on the Iron Canyon Project presented by Mr. Hopson and his assistants, consider the various alternatives, and make such recommendations regarding them as may appear proper to you, expressing the opinion of the board if possible regarding the preference to be given to any one of the various alternatives and suggesting such further course of action as may seem wise.
>
> "If none of the alternatives appear to the board to be desirable, but further work should be undertaken along some lines not now anticipated, it will be the duty of the board to suggest further investigation. This may very properly be done with a view to bringing to the attention of Secretary Lane and to the appropriation committee of Congress an item for further surveys and examinations in connection with the work to be authorized in 1915 and 1916."

In accordance with these instruction, we have studied the report on the Iron Canyon project prepared by Mr. E. G. Hopson, supervising engineer of the Reclamation Service, dated October, 1914. This report is very able and comprehensive.

The board convened at Red Bluff, California, November 9, 1914, and visited the Iron Canyon damsite, viewed the proposed main canal locations and inspected the lands to be irrigated.

This report makes possible the comparison of ten different plans of development, all involving the irrigation of 225,000 acres of land, but differing in respect to the required storage and the important incidental features of navigation, flood control and power development.

The plans which require storage are based on building a dam at Iron Canyon, for which three heights have been considered, raising the low water respectively 112, 125 and 134.5 feet.

Provisions made for the irrigation of 225,000 acres are the same in each case, consisting of supplying 3 acre-feet of water per acre, properly proportioned throughout the irrigation season, which is ample. This supply could have been furnished in full for all of the eighteen years for which records of run-off are available, except in case the plans be made to include the feature of flood control, when two years out of eighteen would have been short, only one, however, to a material extent.

In connection with the construction of a high dam at Iron Canyon a large amount of power can be economically developed.

The arguments in the Hopson report in favor of storing at Iron Canyon rather than at points upstream are convincing.

All of the plans proposed are feasible. Even on the basis of considerably higher estimates of cost, which may result from complete investigation, the cost of irrigation is far within the limits of value, provided the item of interest during construction and early years of development is not large or is absent, as assumed in the Hopson report.

Unless further investigation should reveal entirely unexpected conditions, the Iron Canyon dam can be built with safety, although its construction may, under adverse conditions, involve a larger expense than what may now appear to be a liberal estimate.

The plan calling for the least immediate outlay is the one in which no storage is provided and which proposes to draw irrigation water direct from the river flow, which at all times is ample. This plan in its main features seems the most desirable for the following reasons:

It can be built in the shortest time.

It is least involved as regards other interests.

The acreage irrigable from the project can be readily extended from 225,000 to 325,000 acres.

The rights to river flow of other interests lower down on the stream are not in any way affected by project diversions.

The plan interferes with navigation and provides no element of power development or flood control. It does, however, leave undisturbed for future utilization the Iron Canyon reservoir site. To avoid uncertainties as to water rights, federal and state legislation will be necessary.

The problem of development of the Sacramento Valley must be viewed from a broad standpoint. The interests of irrigation and navigation can not fail to be frequently antagonistic and if a policy were to be adopted permitting no irrigation that interferes with navigation, the unavoidable result would be the heavy handicapping of irrigation enterprises and a very slow and limited development. The irrigation of more than half a million acres in the upper Sacramento Valley is of an economical and political importance to the state and to the general government enormously surpassing any injury which may result to the interests of navigation. Irrigation should be unquestionably made paramount throughout the arid and semi-arid regions. Any injury to navigation from the effect of such policy in this case may well be made good by Congress through the improvement of the river channel below Sacramento in line with important work now being carried out.

The policy of using the flow of the river for irrigation irrespective of navigation is but applying in a concrete case the consensus of opinion towards which eminent members of the engineering profession familiar with conditions on the Pacific coast and men of large vision and impartial opinion throughout California have been centering for the past twenty years. Navigation interests along the Sacramento River above the city of Sacramento are now imperfectly cared for and river traffic is small and desultory. The moral effect of navigation in affecting railroad rates has quite passed since the coming into existence of the California Railroad Commission with its large and far-reaching powers. Below Sacramento the injury may be serious, but can be made good by channel deepening or by artificial works and canals.

Traffic by water from Suisun Bay to Sacramento can be cared for much better by ship canal than is possible by natural channels. Such canal would enable deep water vessels to reach Sacramento at all times.

The most desirable proposition for the Iron Canyon project is similar to plan B-3 of the Hopson report. It consists of diverting the river flow so far as needed for irrigation at some point near or above the town of Anderson. It is feasible to lay out the works so that they may ultimately irrigate all the lands on both sides of the Sacramento River below Red Bluff which can be economically served from this source without storage, possibly amounting in all to 325,000 acres or more. The cost including distributaries would approximate $55 per acre of land exclusive of interest. After completing the diversion dam and one of the main canals to Red Bluff, units could be built and added as may seem most desirable.

It is essential that the state pass an act permitting the withdrawal of the necessary water for project purposes for a period of time ample to permit full investigation, construction and gradual development. Contingent thereon Congress should enact a law which will permit the flow of the Sacramento River to be used for irrigation purposes. This last is necessary to remove doubtful water right features, not only from this project but from all irrigation enterprises along the stream.

All the land under the project is privately owned and much of it is held in large estates which should be broken up for irrigation development. This can probably be best accomplished through the agency of one or more irrigation districts, taking water from the main canals to be built by the federal and state government either singly or in co-operation.

With these conditions complied with, the project is feasible and desirable. By completely abandoning all ideas of using the water passing the Iron Canyon damsite for any purpose except irrigation, the Iron Canyon Project can be enlarged to a total of about 800,000 acres.

It is concluded:

1 That the run-off of the Sacramento River at Red Bluff should be used as far as practicable for irrigation in the Sacramento Valley, irrespective of navigation.

2. That by means of a canal system diverting water near or above Anderson, using the natural flow of the Sacramento River, about 325,000 acres may be irrigated.

3. That by the construction of an impounding reservoir in and above Iron Canyon of about 600,000 acre-feet capacity and by using excess flow of the Sacramento in connection with the stored water a supply can be made available for an aggregate area of 800,000 acres in the Sacramento Valley.

4. That by the use of the water of the Sacramento River for irrigation and domestic supply alone as paramount to all other uses, a very large population may be supported and maintained in comfort on lands now semiarid.

5. That the Sacramento River above Sacramento can not be made an efficient navigable stream at low stages by methods of open river channel improvement, whether or not water be diverted from the river.

It is recommended:

a. That all public and state lands which may be required for the Iron Canyon Project be withdrawn or continue withdrawn from entry or sale.

b. That the state legislature pass an act permitting the withdrawal of water for the necessary time on behalf of a maximum feasible acreage to be included in the Iron Canyon Project.

c. That Congress enact a law permitting diversion of water from the Sacramento River for irrigation purposes regardless of navigation, contingent upon the state legislating as in recommendation "*b*."

d. That upon the above acts being passed the Secretary of the Interior co-operate with the state of California and with the interested organizations in rendering available the sum of $100,000 for the more complete investigation and delimitation of the project along the lines herein proposed.

(Signed) WM. L. MARSHALL,
Consulting Engineer to the Secretary of the Interior.

(Signed) W. F. MCCLURE,
State Engineer of California.

(Signed) D. C. HENNY,
Acting Chief Engineer, U. S. Reclamation Service.

(Signed) H. T. CORY,
Engineer for the Iron Canyon Project Association.

APPENDIX C.

REPORT ON THE

Utilization of Mojave River for Irrigation in Victor Valley, California

By MOJAVE RIVER COMMISSION: W. F. McCLURE, State Engineer, Chairman; J. A. SOURWINE, Engineer for San Bernardino County; and C. E. TAIT, Senior Irrigation Engineer, Office of Public Roads and Rural Engineering, United States Department of Agriculture.

(Based in part on data gathered under co-operative agreement between the Office of Public Roads and Rural Engineering, Irrigation Division, of the United States Department of Agriculture, and the California State Department of Engineering.

PREFACE.

In December, 1916, a petition was presented to the Board of Supervisors of San Bernardino County praying for the formation of an irrigation district in Victor Valley, east of the Mojave River. Under the provisions of the law, the State Engineer was called on to report upon the feasibility of the project, and he caused an examination to be made therefor.

It was found that many conflicting claims exist to the water intended to be taken for the proposed district, by lands which seem to have an equally good right to the water to those lands embraced in the proposed district.

The State Engineer, finding that in the one month allowed by law in which to make his investigation it would be impossible to ascertain whether sufficient water was available to the district for its proper development, recommended that the matter be held in abeyance until the whole question of the utilization of the waters of Mojave River could be analyzed and studied, and he suggested that a fund be provided to defray the cost of making a thorough examination.

The Board of Supervisors placed funds at the disposal of the County Engineer to pay the expenses of such an investigation to be made jointly by the San Bernardino County Engineer, the Office of Public Roads and Rural Engineering of the United States Department of Agriculture, and the State Department of Engineering.

This report is the result of the investigation and studies of the subject made under the co-operative direction of the agencies named.

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LETTER OF TRANSMITTAL.

April 30, 1918.

To the Honorable Board of Supervisors, County of San Bernardino,
San Bernardino, California.

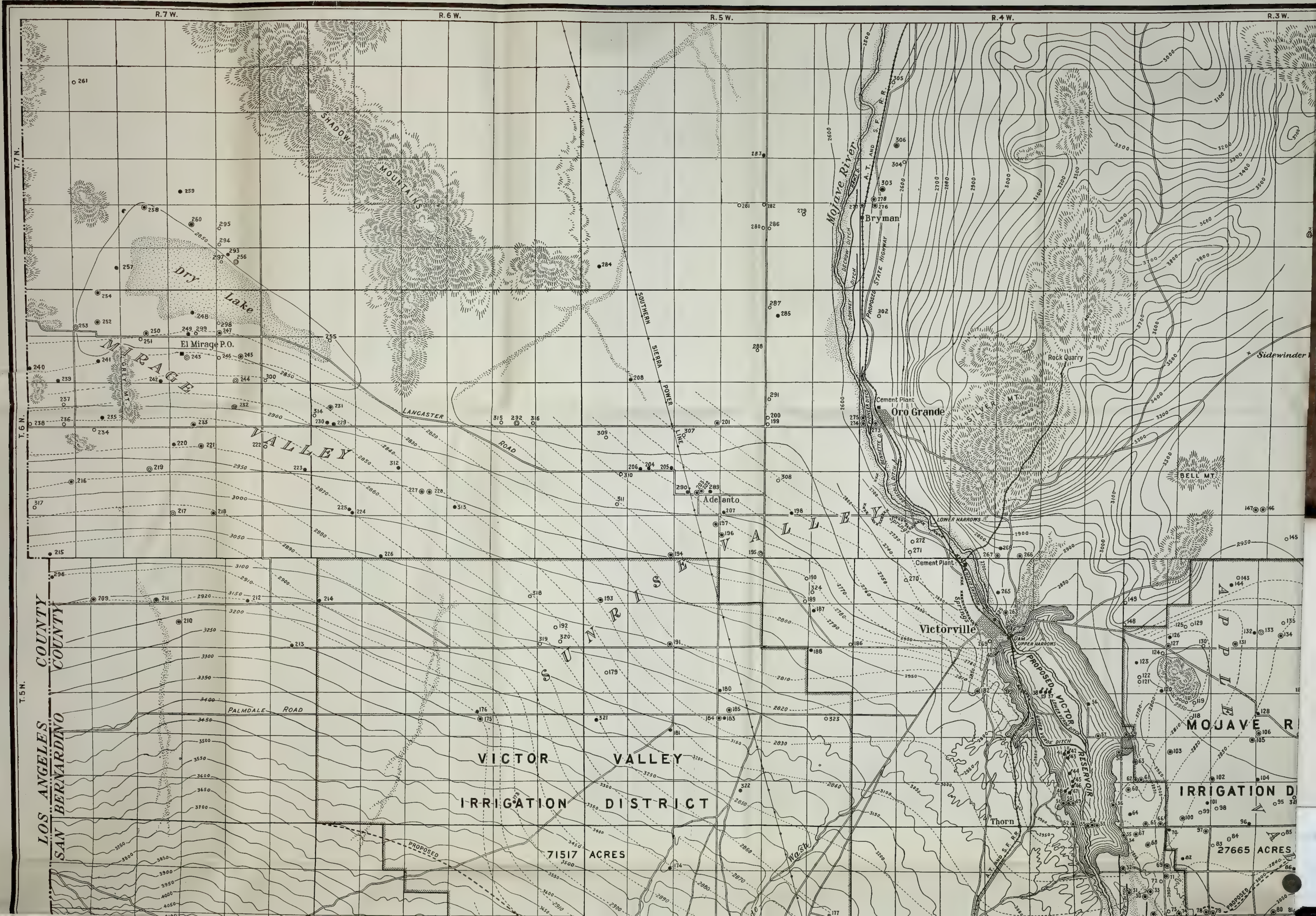
GENTLEMEN: In accordance with the instructions of your Honorable Board, we are submitting herewith a report, embodying the summary of the studies made by this commission.

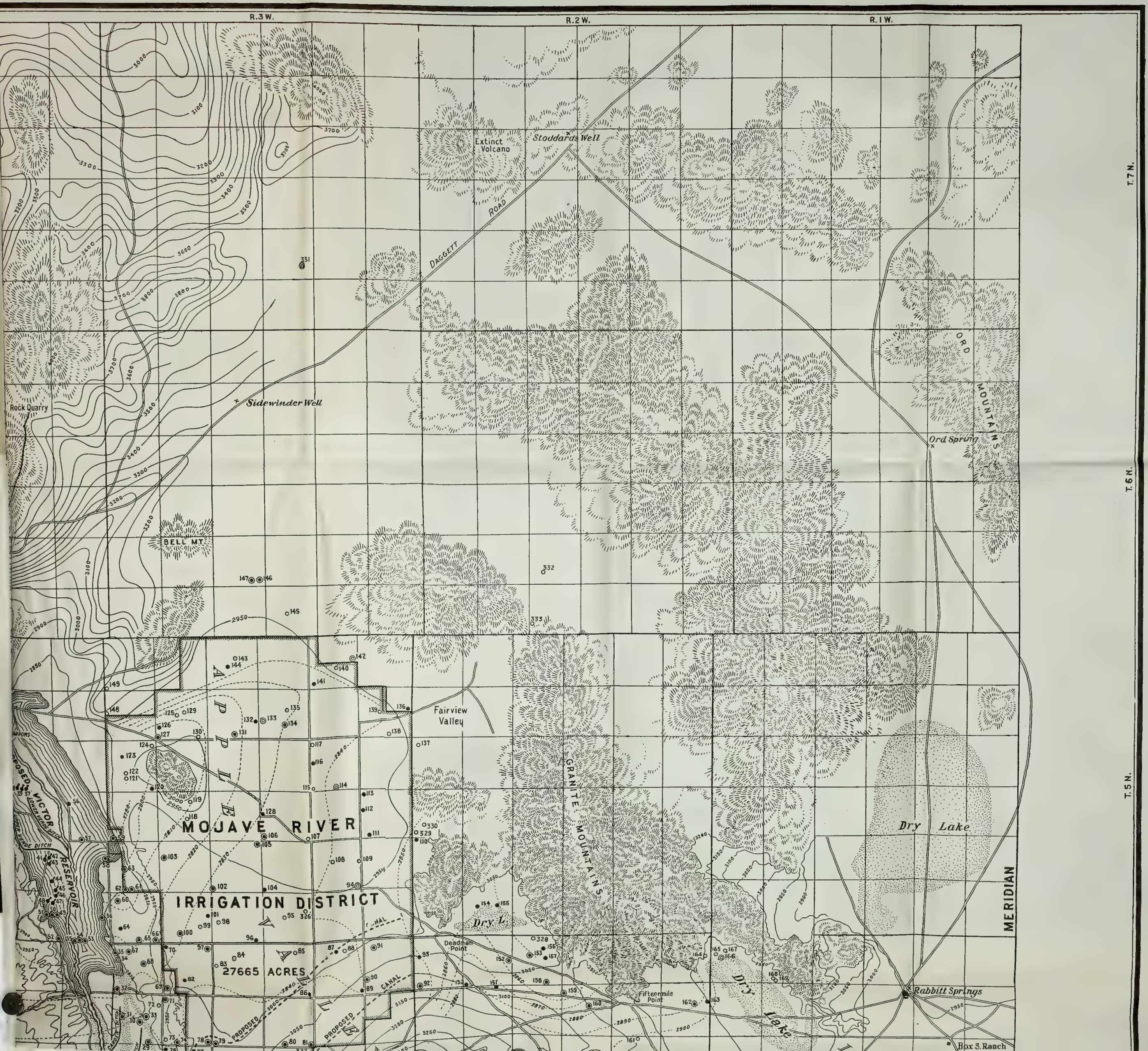
Your instructions read, "This commission shall have power to make such engineering investigations as may be necessary to show the water available, the proper duty of water, the sufficiency of proposed reservoir and dam sites, and the general feasibility of the required engineering works."

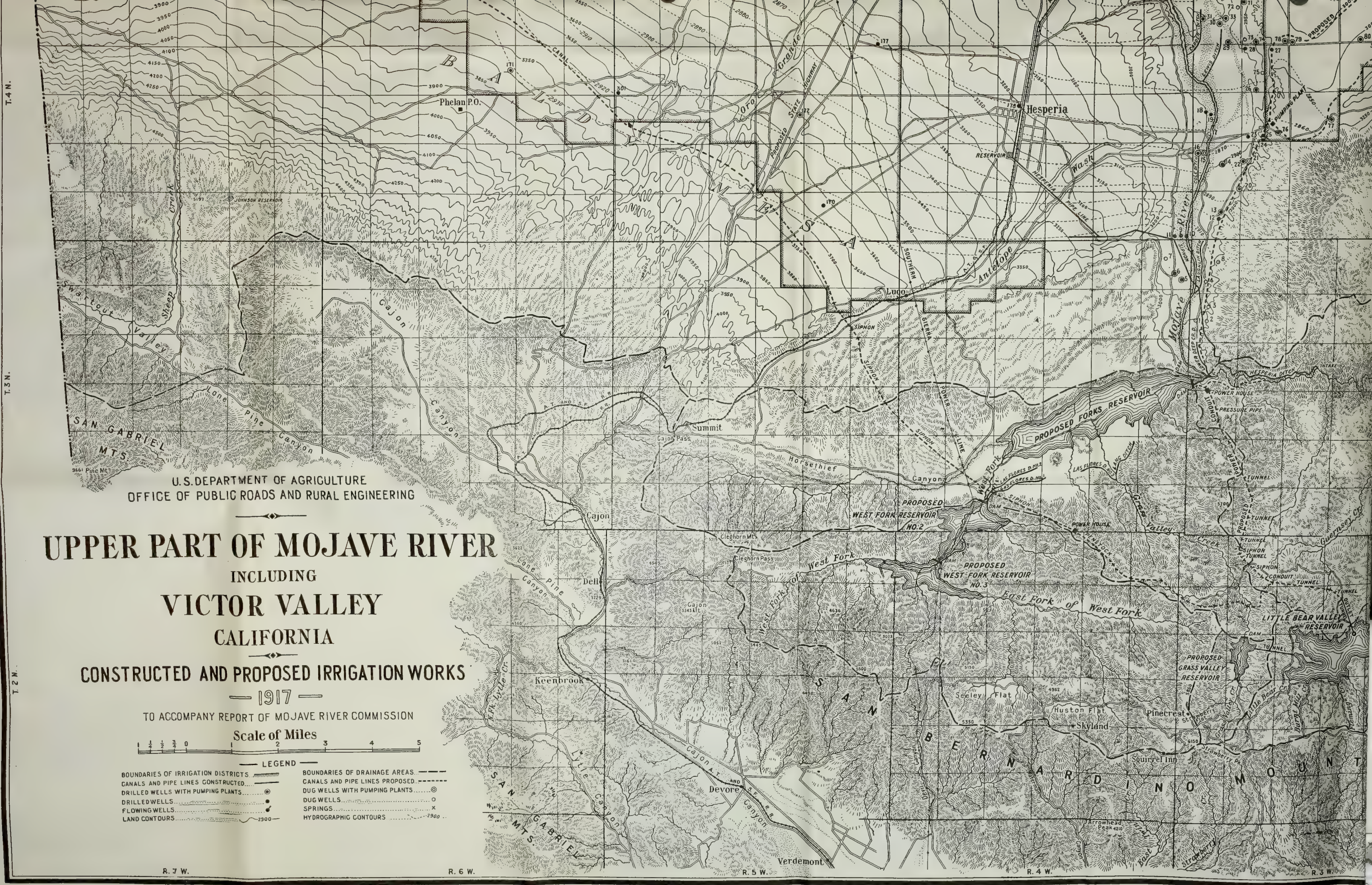
It has not been deemed necessary or expedient to encumber the report with all the detail data acquired in making the investigations.

Respectfully submitted.

THE MOJAVE RIVER COMMISSION.
W. F. MCCLURE,
State Engineer, Chairman.
J. A. SOURWINE,
Engineer for San Bernardino County.
C. E. TAIT,
Senior Irrigation Engineer, Office of Public Roads and Rural Engineering, United States Department of Agriculture.


R.7 W.
R.6 W.
R.5 W.
R.4 W.
R.3 W.
T.7 N.
T.6 N.
T.5 N.
SHADOW MOUNTAINS
Dry Lake
MIRAGE VALLEY
GREY MT.
El Mirage P.O.
LANCASTER ROAD
SOUTHERN SIERRA POWER LINE
Adelanto
SUNRISE VALLEY
Mojave River
A. T. AND S. F. R.R.
BEDROW DITCH
DOWNEY DITCH
PROPOSED STATE HIGHWAY
Bryman
Cement Plant
Oro Grande
SILVER MT.
Rock Quarry
BELL MT.
Sidewinder
LOWER NARROWS
Cement Plant
Victorville
UPPER NARROWS
PROPOSED VICTOR RESERVOIR
UPPER VERDE DITCH
Thorn
APPLE VALLEY
MOJAVE R
IRRIGATION D
27665 ACRES
LOS ANGELES COUNTY
SAN BERNARDINO COUNTY
PALMDALE ROAD
VICTOR VALLEY IRRIGATION DISTRICT
71517 ACRES
PROPOSED
Wash
A.T. AND S.F. R.R.


R.3W.
R.2W.
R.1W.
T.7N.
T.6N.
T.5N.
Extinct Volcano
Stoddards Well
DAGGETT ROAD
Sidewinder Well
Rock Quarry
BELL MT.
ORD MOUNTAINS
Ord Spring
GRANITE MOUNTAINS
Fairview Valley
APPLE VALLEY
MOJAVE RIVER
IRRIGATION DISTRICT
27665 ACRES
PROPOSED VICTOR RESERVOIR
LOWER VERDE DITCH
UPPER VERDE DITCH
PROPOSED CANAL
Dry L.
Deadman Point
Fifteenmile Point
Dry Lake
Dry Lake
Rabbitt Springs
Box S. Ranch
MERIDIAN



U.S. DEPARTMENT OF AGRICULTURE
OFFICE OF PUBLIC ROADS AND RURAL ENGINEERING

UPPER PART OF MOJAVE RIVER
INCLUDING
VICTOR VALLEY
CALIFORNIA

CONSTRUCTED AND PROPOSED IRRIGATION WORKS

— 1917 —

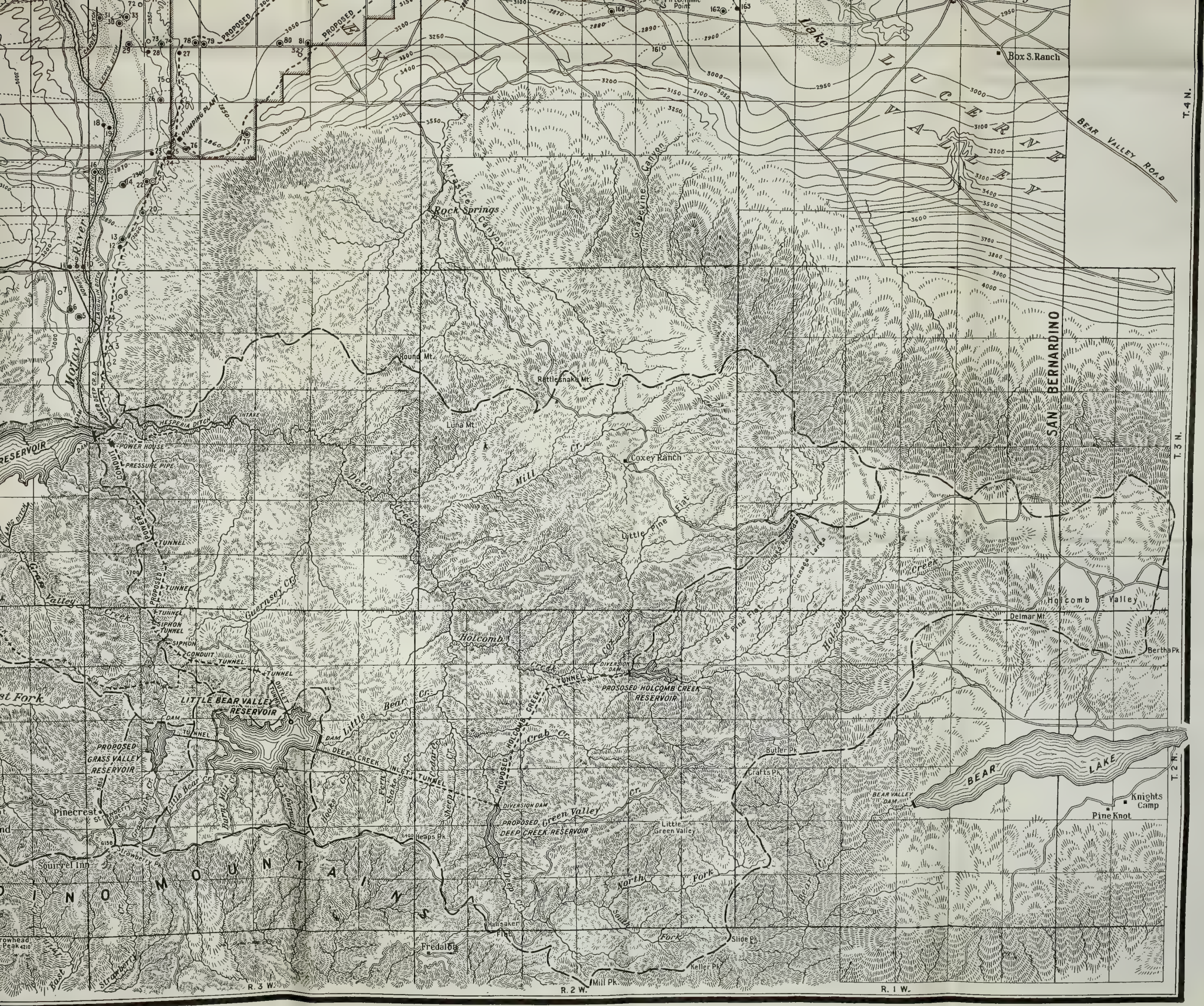
TO ACCOMPANY REPORT OF MOJAVE RIVER COMMISSION

Scale of Miles

1 ¼ ½ ¾ 0 1 2 3 4 5

— LEGEND —

BOUNDARIES OF IRRIGATION DISTRICTS
CANALS AND PIPE LINES CONSTRUCTED
DRILLED WELLS WITH PUMPING PLANTS ◉
DRILLED WELLS ●
FLOWING WELLS
LAND CONTOURS 2900
BOUNDARIES OF DRAINAGE AREAS — — —
CANALS AND PIPE LINES PROPOSED - - - - - -
DUG WELLS WITH PUMPING PLANTS ◎
DUG WELLS ○
SPRINGS ×
HYDROGRAPHIC CONTOURS 2900


Lucerne Valley
Lake
Box S. Ranch
Bear Valley Road
T. 4 N.
T. 3 N.
T. 2 N.
R. 3 W.
R. 2 W.
R. 1 W.
San Bernardino
Mountains
Mojave River
Pumping Plant
Proposed
Arrastre Canyon
Grapevine Canyon
Rock Springs
Round Mt.
Rattlesnake Mt.
Luna Mt.
Coxey Ranch
Mill Cr.
Deep Creek
Little Pine Flat
Big Pine Flat
Holcomb Creek
Holcomb Valley
Delmar Mt.
Bertha Pk.
Hesperia Ditch
Intake
Reservoir
Dam
Power House
Pressure Pipe
Power Conduit
Tunnel
Proposed Tunnel
Siphon
Siphon Tunnel
Conduit Tunnel
Outlet
Guernsey Cr.
Grass Valley
Grass Valley Creek
East Fork
Little Bear Valley Reservoir
Proposed Grass Valley Reservoir
Little Bear Cr.
Deep Creek Inlet Tunnel
Holcomb Creek Tunnel
Diversion Dam
Prososed Holcomb Creek Reservoir
Proposed Holcomb Creek
Crab Cr.
Coxy Cr.
Fern Cr.
Shake Cr.
Cedar Cr.
Sheep Cr.
Hooks Cr.
Proposed Deep Creek Reservoir
Green Valley Cr.
Little Green Valley
Heaps Pk.
Butler Pk.
Crafts Pk.
Bear Lake
Bear Valley Dam
Knights Camp
Pine Knot
Pinecrest
Strawberry
Strawberry Pk.
Squirrel Inn
Arrowhead Peak 4210
North Fork
South Fork
Bear Cr.
Hunsaker Flat
Fredalba
Slide Pk.
Keller Pk.
Mill Pk.
3000
3100
3200
3300
3400
3500
3600
3700
3800
3900
4000

REPORT ON THE

UTILIZATION OF MOJAVE RIVER FOR IRRIGATION IN VICTOR VALLEY, CALIFORNIA.

BY

MOJAVE RIVER COMMISSION.

W. F. McClure, State Engineer, Chairman; J. A. Sourwine, Engineer for San Bernardino County; and C. E. Tait, Senior Irrigation Engineer, Office of Public Roads and Rural Engineering, United States Department of Agriculture.

INTRODUCTION.

The investigations for this report related to the following subjects: The economic problems confronting the land entrymen and settlers; the history; constructed works and future plans of the corporate enterprises; the water rights for which allowance must be made; the amount and movement of the underground water; the extent to which pumping from wells can be depended upon for irrigation; the amount of the annual surface water supply; the possible sites for storage; the possibilities of hydroelectric power development; the proper duty of water; the area for which reclamation can be safely undertaken; and the most efficient and economical plan of irrigation works.

The investigations of riparian lands are not as complete as it was desired to make them, but, considering the time and funds available, it was necessary to limit the studies in this direction.

Data were secured on all the wells in the region and the elevations of the ground surface and water surface for many of the wells were obtained by leveling from the government bench marks. This enabled hydrographic contours to be located and permitted the formulating of conclusions regarding the movement of underground water.

All records of stream discharge and of precipitation in the watershed were reviewed and correlated in arriving at the amount of water available for use.

Data on duty of water for the crops suited to the region were secured throughout Victor Valley, also from other sections of southern California with similar conditions.

Complete contour surveys were made of two possible reservoir sites which, together with private surveys of other sites, give data on all the available sites for storage.

It has not been practical to present a detailed review of the plans previously proposed for the utilization of the waters of Mojave River.

The map has been prepared from official and authentic private sources and from original surveys by the commission.

Acknowledgments.

Space does not permit acknowledgment of all the courtesies extended to the authors of this report by the many owners of wells and ditches in Victor Valley, but the commission desires to acknowledge special aid as follows: Victor H. Smith, President, Arrowhead Reservoir and Power Company, for valuable discharge measurements of Mojave River and tributaries; F. C. Finkle, Consulting Engineer for the same company, for description of the company's works; H. Hawgood, Consulting Engineer for the Mojave Water and Power Company, for useful discharge measurements of Mojave River; J. B. Lippincott, Consulting Engineer for the Victor Valley Mutual Water Association, for much data on the subject matter; John S. Thayer and Louis Evans, of the Appleton Land, Water, and Power Company, for information on the company's lands and irrigation system; F. E. Trask, Consulting Engineer for the Mojave River Irrigation District, for information as to the plans of the district; F. M. Walton, Manager of the Victor Valley Irrigation District, for information as to the plans of this district; and to Byron Waters, Attorney for ditch owners on Mojave River, for historical facts.

W. A. Johnstone and A. E. Chandler, of the California State Water Commission, visited the territory being investigated and made suggestions regarding water rights; O. E. Meinzer, of the United States Geological Survey, gave access to a report by G. A. Waring on the geology and ground waters; Charles A. Jensen, of the Bureau of Plant Industry, United States Department of Agriculture, allowed the use of apparatus for determining the wilting percentages of the soils; and C. G. Haskell, Irrigation Engineer, Office of Public Roads and Rural Engineering, United States Department of Agriculture, co-operated in the investigation of the wells.

The commission was assisted by the following: P. M. Norboe, Assistant State Engineer, assisted in organizing the field work; Robert T. Hill, Consulting Geologist, advised as to the character of some of the dam sites; F. J. Veihmeyer, Irrigation Engineer, Office of Public Roads and Rural Engineering, United States Department of Agriculture, conducted the examination of the soils and assisted in the canvass of the wells; Fred D. Bowlus, Irrigation Engineer of the same department, made the contour survey of the Mirage Valley and collected data on water rights; Porter V. Hanf, of the County Surveyor's office, San Bernardino County, had charge of the topographic surveys of the West Fork reservoir sites; H. L. Way, of the same office, collected most of the data on duty of water; Wilber D. Cook assisted in the compilation of the map; and Williams M. Humans prepared the map for publication.

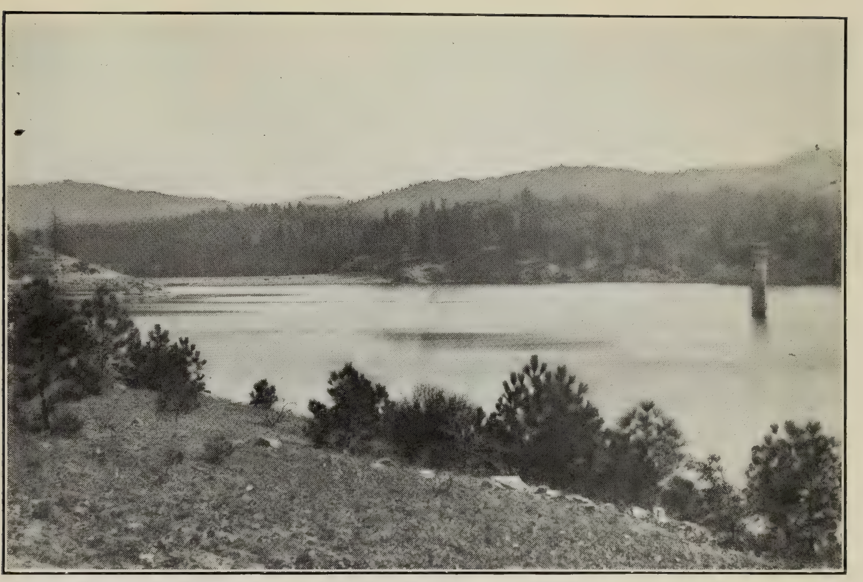


Plate II, Fig. 1.—Little Bear Valley Reservoir, November, 1917, showing dam at left and gate tower at right.

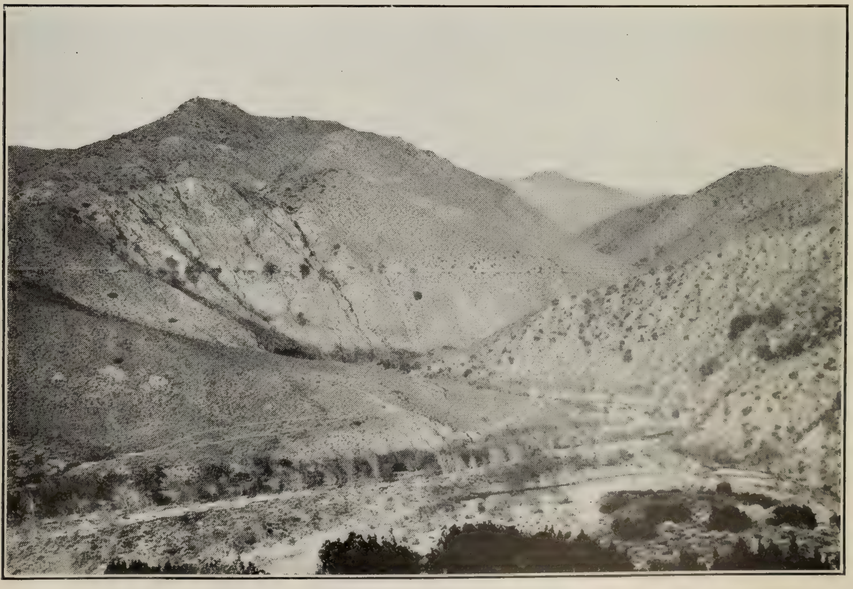


Plate II, Fig. 2.—Forks of Mojave River and Mouth of Deep Creek, showing Hesperia Ditch on Side of Mountain.

Plate III, Fig. 1.—East Fork of West Fork of Mojave River above Dam Site No. 3.

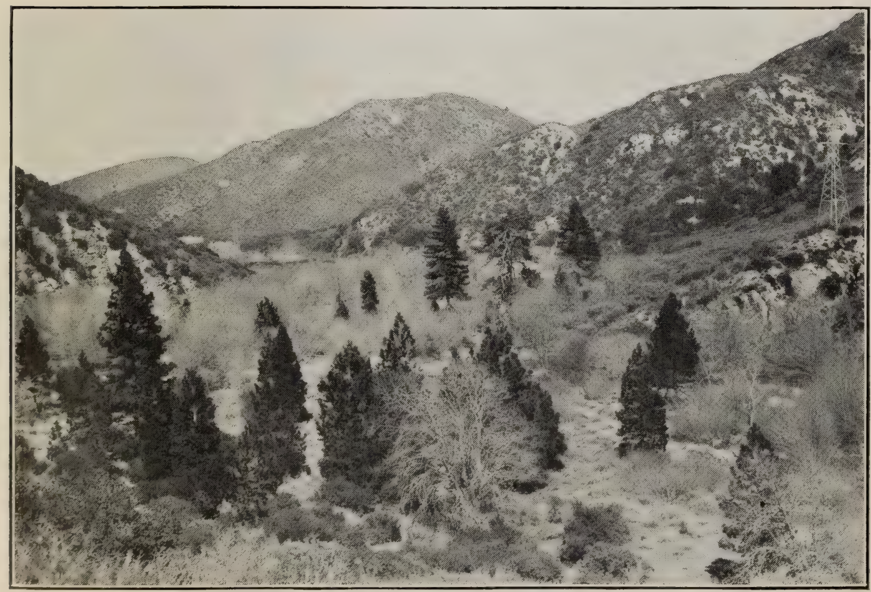


Plate III, Fig. 2.—Dam Site No. 3-B, West Fork, Mojave River, looking downstream.

DESCRIPTION.

Mojave River is situated in San Bernardino County, California, and constitutes the chief drainage system of the northern slopes of the San Bernardino Mountains. The mountain headwaters comprise two distinct branches, East Fork, or Deep Creek, and West Fork, which unite at the base of the mountains to form the main river. This junction is known as the Forks. (Plate II, Fig. 2.) Below it the river, in its course 90 miles across the desert plain, receives not a surface tributary of consequence. The course of the river is first northward 30 miles, then northeastward 20 miles, and finally eastward 40 miles. The river sinks at Soda Lake at an elevation between 900 and 1,000 feet above sea level. The mountain watershed of the river, 217 square miles in area, extends from an elevation of 8,000 feet at the summit of the range to 3,000 feet at the Forks. The upper portion has heavy precipitation and the main tributaries are never dry. In summer the water sinks in the river a short distance below the Forks but appears again several miles below, reaching the Upper Narrows (Plate V, Fig. 1) at Victorville, 14 miles below the Forks. The surface flow continues through the Lower Narrows (Plate V, Fig. 2) 4 miles farther down stream and again sinks several miles below Oro Grande. The water is then brought to the surface for short distances at a number of other points, these points being farther apart and the flow of diminishing quantity toward the lower end of the stream. At places in the dry channel water may be had by digging to shallow depths. The water is generally seen at Helen 10 miles below Oro Grande and again at Hicks. The valley is confined between bluffs from the mountain to this point, but between Hicks and Barstow it widens on the northwest side. The channel is again between bluffs from Barstow to Daggett and the water is at the surface at Barstow and at Nebo, 4 miles above Daggett. Below Daggett the river crosses a broad plain. The stream is twice more between bluffs, at Camp Cady and at the Caves, and at both places the water is at the surface. The Caves are remarkable for the columnar appearance and the variegated coloring which nature has given the clay bluffs of the canyon walls. Below the Caves the channel is dry in summer.

The late winter flood water resulting from the melting of the snow always reaches to Barstow and generally to Camp Cady as an unbroken stream. Some years it reaches entirely to the broad basins of Soda and Silver lakes, which it fills to a shallow depth and in which the water gradually disappears by sinking and evaporating. The flood water generally flows to Barstow from December to April or May.

This report is concerned chiefly with the upper part of the river, including the mountain watershed and the adjacent mesas known as Victor Valley, and with the ditches having rights to water. The east mesa is known as Apple Valley and the lower portion of this mesa bordering the river bottom is called the First Bench. The upper portion of the west mesa (Plate VI, Fig. 1) above Hesperia and stretching westward along the foothills beyond Cajon Pass is known as Baldy Mesa, the name being derived from Mount San Antonio, generally called Baldy. The lower and northern portion of the west mesa about the settlement of Adelanto is called Sunrise Valley and the section around the dry lake bed at Grey Mountain (Plate VI, Fig. 2) is called Mirage Valley.

EARLY HISTORY.

Although the history of the Mojave River country after the beginning of irrigation is more essential to this report, a few facts relating to the early period may be of interest and not out of place.

Until about the time of the Civil War the territory along the river was dominated by the Piute Indians and it was not a place of safe habitation.

Aside from the native Indians, probably among the first to explore this part of the desert were Jedediah Smith and his party of trappers from Salt Lake City, who in 1827 crossed Colorado River at the Mojave Indian villages (now Fort Mojave) and traveled westward to the course of a river, undoubtedly the Mojave, which was thereafter followed toward a pass, the Cajon, in the Coast Range en route to Los Angeles.[1] The trip was repeated the following year, but while crossing the Colorado River on a raft this party was attacked in midstream by the Indians, who had been friendly on the first trip but who had then been excited to hostility by the Spanish, and eight of the twelve members were killed. The survivors, as had the party of the previous year, crossed the desert and arrived in Los Angeles after much hardship.

Again, in 1829, Ewing Young, at the head of another party of trappers, a youthful member of which was later to be General Kit Carson, made a similar journey.[2] A member of this party has described the stream as a dry river rising in the Coast Range and leading northeast into the Great Basin, which was followed several days before water was found; also as a singular stream running southeast 200 miles and emptying into Colorado River, not two miles of its entire length in which it does not disappear, and in part resembling a line of shallow lakes. In four days after leaving the river the party arrived at San Gabriel Mission, where they were much refreshed. The river could have been none other than the Mojave, and the pass was undoubtedly the Cajon.

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[1] History of the American Fur Trade of the Far West, by Capt. H. M. Chittenden.

[2] Kit Carson Days, by E. L. Sabin.

Evidently these early travelers were unaware of the sinking of the river at Soda Lake, 100 miles westward from Colorado River, and believed its course could be traced to a junction with the larger stream. Whether the emigrants who later, but prior to the fifties, traveled the Spanish or extension of the Santa Fe trail from Colorado River to Cajon Pass discovered this error is not known. Certain it is that the early official maps show a junction with the Colorado, and that the Army engineers believed them to be correct until 1853, when reconnaissance surveys were made by the War Department for a railroad from the Mississippi River to the Pacific Ocean.

That part of the survey in California was in charge of Lieutenant R. S. Williamson, who had with him William P. Blake, geologist, and 25 soldiers in command of Lieutenant George Stoneman as a military escort to guard against attack by the Piute and Mojave Indians. Lieutenant Williamson, after deciding on Tehachapi Pass as the most practical entry from the Tulare to the Great Basin, set about to locate the best route from there to the mouth of the Gila River, where his survey was, according to instructions, to join that of another party working from the east.[1]

It was reasoned that to cross the Sierra Madres to Los Angeles by the Soledad and Newhall passes would but necessitate another crossing of the Coast Range to reach the Gila. Not only was Warners Pass believed to be the only gateway from the southern California coast to the Colorado Desert, but it was also believed that by running eastward from the Tehachapi to Mojave River and then following that stream to its supposed junction with the Colorado and finally along the Colorado to the mouth of the Gila, that excellent grades would be offered. An alternate or second possible route in order of preference was to go up instead of down the Mojave River in the hope of finding a pass through the San Bernardino Mountains at the headwaters of the river which would lead to Colorado Desert with but a single crossing of the range. A route southward through Cajon Pass was not considered because it would, like a route through Los Angeles, require a second crossing at Warners Pass, understood to be impractical for a railroad.

The surveying party traveled along the north side of the Sierra Madres and arrived where the Spanish Trail from Cajon Pass reached Mojave River (probably below the Lower Narrows), October 19, 1853. Here the river is described as a broad shallow stream with valley abundantly wooded between terraced banks from one to three miles apart. The water soon sank to reappear at some point of rocks below. A detachment was sent up the river, who soon returned with the information that it would be impossible to reach the Gila by the ascent of the Mojave.

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[1] Explorations and Surveys for a Railroad Route from the Mississippi River to the Pacific Ocean, Vol. V. War Department.

Being now more confident of the preference for the river route, Lieutenant Williamson started down the river, and as he progressed found it more difficult to procure sufficient water for his mules at some of the camps, it being necessary to dig in the sands of moist places in the channel.

Finally, a canyon between clay bluffs 100 feet high, with a running stream for seven miles, evidently the Caves, was reached. Below this canyon was a sandy plain on which the channel was entirely lost, but a lake bed (Soda Lake) was observed to the north, which on examination was found to be 15 miles long and covered with an incrustation of salt and moist in places. Camp was located at springs (Soda Lake Spring), at the base of mountains near the lake bed, for headquarters for further exploration. The first lake bed was found to be connected to another (Silver Lake) two or three miles to the north of it by a ditch about 20 feet wide and 2 feet deep. This second basin, reached November 16, 1853, had a smooth floor of hard dry clay, and it, like the first, was found to have no outlet. Thereupon it was concluded that the river sank in the first basin and that the accumulating flood water when high overflowed into the second basin.

Having determined the maps showing a channel for 100 miles farther east to the Colorado River to be erroneous, Lieutenant Williamson abandoned the idea of a railroad over this route and retraced his steps to Soledad Pass, through which they went to Los Angeles and on to San Bernardino, and from which latter settlement he expected to go to Warners Pass by way of Temecula. But at San Bernardino he was informed of the existence of San Gorgonio Pass and as a second surprise found excellent grades for a railroad through this pass situated between the two highest peaks in southern California, Mount San Gorgonio and Mount San Jacinto. It is of interest to note that the Southern Pacific from Tehachapi to Yuma was constructed practically on the route finally recommended by Williamson, also that portions of the Santa Fe and Salt Lake follow in part the general route he first attempted to survey.

Emigrants, including gold seekers in '49, came to southern California through the thirties and forties from New Mexico and the East[1] over the Spanish Trail, striking Mojave River at Soda Lake Spring and following it to the Lower Narrows, thence diverging toward Cajon Pass. After the Mormons blazed the Salt Lake Trail and settled the new San Bernardino in 1851, their wagon trains increased the traffic. The freighters carried supplies from Los Angeles and San Bernardino to the mines both northward and eastward. The northward route branched off from the older trail at the "Forks of the Road" near where Daggett has been located. A toll road was instituted in 1862 and during the sixties regular stage service was in operation along the river.

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[1] Century Annals of San Bernardino County, by L. A. Ingersol.

By the late sixties stockmen, who at first only ranged their cattle in the region, risked danger of depredations by the Indians and began to live along the river. The first settlements were the stations on the trail, located where the lands were moist or where the flow of the river was sufficient for the growing of hay to feed cattle and supply the freighters. Settlements were made near the Lower Narrows and at other points down the river. Although not immediately on the trail, other choice locations settled early were just above the Upper Narrows where the Brown Ranch was started and in the valley of the West Fork, called Dunlap Valley.

The report of Lieutenant Eric Bergland, on his expedition in 1875,[1] records conditions on the river at the time. He had been instructed to examine the feasibility of diverting the Colorado River of the West from its channel for purposes of irrigation.

Starting with his party from Los Angeles, he made his outward journey to the Colorado along Mojave River, arriving at Lane's Upper Crossing, the highest station on the stream and located just below the Lower Narrows, June 29, 1875. Here the river was found to be 100 feet wide and 3 feet deep. Bergland's map shows the successive stations going down the river to have been: Point of Rocks, now Helen; Cottonwood, now Hicks; Grapevine, now Barstow; Forks of the Road, located eight miles below the site of Daggett; Camp Cady, then an abandoned military post; the Caves, and Soda Lake Spring. The eastward trail continued by way of Marl Spring and Piute Hill to Fort Mojave. The Mormon trail branched northward from the Forks of the Road. At a later time the stages, instead of following the bend of the river past Grapevine, traveled a more direct route from Cottonwood to the "Fish Ponds," located on the river between Grapevine and Forks of the Road. Another shorter but less traveled route was from Huntingtons, between the Upper and Lower narrows by way of Stoddard's Well, to Forks of the Road.

Bergland found Soda Lake nearly dry and to give mirages of perfect illusion. He states that the drainage from these saline flats is supposed to connect with Death Valley to the north, but that this had not been proven. It may now be stated that this is as much in error as the once supposed junction with Colorado River. Although some ditches were in use on the upper part of the river at the time, he makes no mention of irrigation; however, he notes having observed vegetation at Point of Rocks, Cottonwood and Camp Cady. Some of the moist lands at the stations produced hay without irrigation.

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[1] Geographical Surveys West of the One Hundredth Meridian, War Department Documents, 1876-77.

A few small ditches are believed to have been used prior to 1870 and more permanent conduits were constructed from 1873 to 1880. Some of the early settlers had no title other than possession to the lands which they occupied and they herded cattle for miles away from the river wherever feed could be found. Aside from pre-empted land in the river bottom, one of the first titles was that granted to Max Stroebel, who, in 1870, acting for an organization known as the Thirty-fifth Parallel Association, purchased from the government, under a statute then in force, about 30,000 acres on the upper part of the river. It is understood that it was the intention to establish a German colony on the land, but no such plan was carried out, and the land, although later transferred, still remains in a single corporate ownership.

ENTERPRISES.

Appleton Land, Water and Power Company.

The Appleton Land, Water and Power Company is the successor of the Hesperia Land and Water Company. The older company was organized in 1886 with an authorized capital stock of $300,000, for the purpose of supplying water to and selling the Stroebel lands which were acquired at the time of organization. The lands had originally been purchased from the government about 1870 when the public lands were, under certain conditions, sold in unlimited quantities at $1.25 per acre. The Stroebel holdings consisted of about 30,000 acres situated in the Mojave River bottom and on the west mesa, and comprised township 4 north and most of the even-numbered section of township 5 north, range 4 west. About 20,000 acres of the lands had been acquired under a single patent.

Soon about 2,000 acres, including the dam site at the Upper Narrows (Plate V, Fig. 1), were sold and the towns of Victorville and Hesperia were started. A tract of 160 acres at the forks of Mojave River, together with the water right appurtenant to it, also the claim to the surplus waters of the West Fork, were purchased. A conduit was constructed to divert water from Deep Creek at a point above the forks and convey it across the main Mojave River for the irrigation of lands in the vicinity of Hesperia on the west mesa. From the intake to the Mojave River the conduit consisted of four miles of concrete lined ditch (Plate II, Fig. 2). The water was then carried under the river by inverted siphon which, together with the extension to Hesperia, consited of five miles of 14-inch steel riveted pipe. The pipe terminated in an earthen reservoir of 58 acre-feet capacity. Some apple orchards were planted and these, together with other crops, made a total of about 1,000 acres which were irrigated from the system at one time. The project had been launched toward the end of a period of unusual activity in the exploitation of lands throughout southern California, and as a reaction there followed a period of general depression among private corporate colonization enterprises accompanied by the complete failure of numerous state irrigation districts. During this era of litigation with its disastrous effect on irrigation securities, the Hesperia company made no further progress and was unable to finance the development of more water for the reclamation of additional land. What was most needed to make the system efficient for the lands sold and adequate for a larger area was storage of winter flood water for use in the late summer when the flow of Deep Creek was at the lowest stage. The area irrigated became smaller, and Hesperia, which had given promise of becoming a prosperous settlement, declined. The water system was operated at a loss. The steel siphon under Mojave River was washed out by flood several times, but was each time replaced, although for two years prior to the reorganization in 1911 no water was delivered at Hesperia. The cost of the irrigation works was estimated at $100,000 in 1910.

In 1911 the system was transferred to a new corporation, the Appleton Land, Water and Power Company, with an authorized capital of $300,000, of which $250,250 is issued. At the time of appraisal by the California Railroad Commission the company stated its assets to be $575,000, and liabilities $448,273. Improvements were begun, including the relining of the intake ditch, the construction of four miles of 30-inch steel riveted pipe, including the inverted siphon under Mojave River which was placed in a new location. Two miles of the old 14-inch pipe connecting the main line with Hesperia remain in place. The diversion works consist of a low concrete dam 20 feet long across Deep Creek and headgates. The capacity of the main conduit is probably 40 second-feet.

The Hesperia Water Company was organized in 1915 with a capital stock of $40,000, of which $10,500 is issued, to distribute and serve water to the town of Hesperia and to the users for irrigation under the system. The Victorville water system is still owned by the Appleton company. The Hesperia Water Company obtains the water from the Appleton company under lease and is classed as a public utility, and as such is regulated by the California State Railroad Commission. The water rate approved by the comission is 1.5 cents per hour-inch. The handling of the water sales under this subsidiary organization divorces the public service from the land colonization enterprise. In 1916 only 90 acres of apple orchard and 220 of alfalfa and corn were irrigated.

Of the Appleton Land, Water and Power Company's lands 20,000 acres are in one tract, 18,000 acres of which are commanded by the main pipe line. Laterals would have to be extended to irrigate this area. The lands are not now being offered for sale.

The land in the Lower Narrows of Mojave River (Plate V, Fig. 2), between Victorville and Oro Grande, which has possibilities as a dam site, was at one time acquired by the predecessor of this company, but it was sold and no storage at the Lower Narrows has been seriously contemplated by these companies or others.

The company claims riparian rights to about 20,000 acres acquired from the government under one patent, also appropriation rights, one relating back to the filing for the ditch purchased, another to the filing for the Deep Creek diversion and conduit to Hesperia, another on the surplus water of the West Fork and the control of other filings made in 1911.

Arrowhead Reservoir and Power Company.

The predecessor of the present Arrowhead Reservoir and Power Company was the Arrowhead Reservoir Company, organized in 1891, the principal stockholders being Cincinnati capitalists. The original plan was a colossal undertaking. It was proposed to construct a main reservoir in Little Bear Valley which would impound the natural drainage of Little Bear Creek, a tributary of Deep Creek. An inlet tunnel, now partly constructed, was to be made from the reservoir eastward to Deep Creek and extended from this stream to Crab and Holcomb creeks to collect all drainage above the tunnel and carry it into the reservoir. Diversion dams and regulating reservoirs were to be located at Deep, Crab and Holcomb creeks and the flow of the smaller streams was to enter the tunnel through shafts. All of these works would be in the Deep Creek watershed. Another reservoir was to be constructed in Grass Valley, westward of the main reservoir and on a tributary of the West Fork of the Mojave River, and this supplemental basin was to be connected with the main basin by a tunnel. Two other reservoirs were to be located in mountain flats, the sites for which were later abandoned. Water was to be taken from the main reservoir by an outlet tunnel through the San Bernardino Range and delivered for the irrigation of lands south of the mountains. The company had no lands for sale and made no contracts for the delivery of water.

A masonry dam, to form the main reservoir, was begun on Little Bear Creek, but by the time the foundation was constructed it was found that suitable rock in sufficient quantity to construct a masonry dam was not to be had near the site. This caused a suspension of construction which was prolonged for a number of years. Data on the amount of water for storage had been meagre and the supply had been overestimated. In 1892 a series of precipitation and run-off measurements was begun throughout the watershed which was continued for 13 years before construction was resumed.

Until 1895 the development of power had not been considered in connection with the project. About that time, when it became known that long transmission of electrical power was practicable, it was planned to utilize the energy of the water in its descent on the southern slope of the mountains.

In 1905 the property was transferred to a new corporation, the Arrowhead Reservoir and Power Company, capitalized at $6,500,000 with nonassessable stock of which $500,000 was 5 per cent preferred and the remainder common stock. Shares representing about $600,000 par value were issued and placed in the hands of a trustee, no payments having been made on these shares. Some of the stockholders have taken notes of the company for other obligations, but the company has no indebtedness outside of the stockholders.

The type of dam for the Arrowhead site was changed to a semi-hydraulic fill with concrete core. The plan of outlet works was also modified. The Burcham ranch, now called Rancho Las Flores, containing 5,240 acres and including the Forks reservoir site (Plate IV, Fig. 2) on the West Fork of Mojave River near the Forks, also two dam sites farther upstream on the West Fork and known as the West Fork sites numbers 2 and 3 (Plate III, Fig. 2, and Plate IV, Fig. 1), were acquired. It was proposed to convey the water in Little Bear Valley reservoir to the Forks reservoir, using the intervening drop for power development. The water would be combined in the forks reservoir with that received from the natural drainage of the West Fork. This lower reservoir was then to be drained by a tunnel through the mountain range to the south side, where another power drop would be located and below which the water would, as under the former plan, be delivered for irrigation in San Bernardino Valley.

About 1909 some of the owners of riparian lands on Mojave River, including the Hesperia Land and Water Company, filed suits to prevent the company diverting water from the watershed, but the cases have not been brought to trial. In 1912 application was made to the California Railroad Commission for permission to issue $4,000,000 in bonds when riparian land owners again opposed the plans of the company by protesting against the granting of the application. The application was denied, without prejudice, for the stated reason that the company's title to water was uncertain until the cases were decided by the courts. The record of the hearings conducted by the commission on the application shows the following:

Valuation put on property at time of reorganization	$1,191,000
Spent by new company since reorganization	923,204
Principal owed by new company	793,796
Interest owed by new company	126,589
Total	$3,034,589

About this time the company, or a trustee of some of the stockholders, began to purchase riparian lands on Mojave River mainly for the purpose of quieting opposition from adverse water right claimants, and 1,000 acres just below the Forks and 3,200 acres, together with most of older and more useful ditches between Victorville and Barstow, were acquired. This property included the Westwater lands below Victorville.

It had been the intention to purchase more riparian lands, but owing to the decision of the State Supreme Court about this time to the effect that flood waters of a stream could not legally be diverted from the natural drainage basin,[1] a radical change in plan was adopted which made this no longer necessary. It was now decided to use the water for the development of power and irrigation on the north side instead of the south side of the mountains. In 1914 an offer, which was not accepted, was made to the city of San Diego to sell the water from the system, the diversion from the watershed for domestic use not being illegal.

In addition to agricultural lands below the Forks, the company holds about 12,000 acres in the mountains, mainly in the Little Bear Valley, Grass Valley and Forks reservoir basins. The company claims riparian rights appertaining to the extensive lands above and below the Forks, also appropriation rights on all streams above the Little Bear Valley reservoir inlet dating from 1890 and on the West Fork and Deep Creek dating from 1905.

The company claims that the measurements show that enough water can be stored to enable the delivery of 40 second-feet continuously from the Little Bear Valley reservoir, or 100 second-feet continuously from this reservoir and the Forks reservoir combined.

The Little Bear Valley dam (Plate II, Fig. 1) is now built to a height of 160 feet above stream bed and is 80 per cent completed. It is to have a maximum height of 200 feet above stream bed and 220 feet above bedrock, a length on top of 830 feet and a top width of 20 feet. The fill will contain 1,562,329 cubic yards of earth and the core will contain 27,999 cubic yards of concrete. The original slopes were, inside 2½ to 1 and outside 2 to 1, but an addition is now being made to the lower fill to change the outside slope to 3 to 1. The core wall is 20 feet thick at the base and tapers to 3 feet thick at the top. That part above a thickness of 4 feet is reinforced. In the winter of 1909 cracks occurred in the top of the core wall which had then been built up 38 feet above the earth fill. The cracking was believed to be due to the effect of temperature on this exposed portion of the concrete. The cracks were repaired. The spillway is over the natural rim of the basin and is 5 feet deep, 100 feet wide and is to be lined with concrete.

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[1] Miller & Lux *vs.* Madera Canal and Irrigation Company, 155 Cal. 60.

The Deep Creek inlet tunnel is under construction, it now being driven and partly lined from the reservoir to a point beyond Shake Creek, a length of nearly two miles. A siphon of 1,284 feet and shafts at Fern, Shake and Sheep creeks are finished. The completed tunnel will be over 14,316 feet long. The tunnel from Deep Creek to Crab Creek is to be 5,000 feet long and the Holcomb Creek extension is to add 12,100 feet. The Deep Creek dam is to be 150 feet high above stream bed, of which height 30 feet would be below the tunnel portal. The Deep Creek reservoir is to have a capacity of 2,000 acre-feet and is to act as a regulator to the inlet tunnel. The tunnel has a capacity of 600 to 1,000 second-feet, depending on the head above the intake. The Holcomb Creek dam is to be 70 feet high, giving a capacity of 1,000 acre-feet to the basin above the tunnel.

The tunnel connecting Grass Valley, 4,172 feet long, is driven and lined, but the Grass Valley dam has not been constructed. The dam as proposed is to be 90 feet high, which would give a storage capacity of 7,632 acre-feet. Water is now diverted from Grass Valley by ditch to and through the connecting tunnel into the main reservoir.

The outlet tunnel of the main reservoir, 5,102 feet long, is constructed and lined, and through it water can now be discharged into Guernsey Creek, a tributary of Deep Creek, above the intake of the Appleton Land, Water and Power Company's canal. The gate tower (Plate II, Fig. 1) is a reinforced concrete structure 185 feet high located in the reservoir basin at the upper end of the outlet. Besides the gate valves in this tower additional valves are placed in a shaft 220 feet deep extending down to the outlet in the rock rim of the reservoir. The maximum head on the outlet will be 175 feet. The maximum depth of water at the dam will be 185 feet. The capacity of the completed reservoir below the floor of the spillway will be 60,179 acre-feet when the area of the water surface will be 883 acres. About 35,000 acre-feet is now stored in the reservoir with the dam partially completed.

The fall from Little Bear Valley reservoir to the Forks is 2,000 feet, a drop sufficient to develop about 7,000 horsepower with 40 second-feet of water. The Forks reservoir site is in a position to receive, naturally, the entire flow of the West Fork, also the water from Little Bear Valley reservoir through the proposed power conduit and the flood water from the lower part of Deep Creek, provided about one mile of inlet ditch or tunnel be constructed from that stream. A dam 150 feet high across the West Fork would give a capacity of 102,000 acre-feet and a reservoir area of 2,000 acres. In addition to the main dam a saddle in the rim of the basin on the north side would have to be raised with an embankment to give this capacity.

Mojave Water and Power Company.

The project now undertaken by the Mojave Water and Power Company was first attempted by the Columbia Colonization Company, organized about 1895. It was proposed to dam Mojave River at the Upper Narrows (Plate V, Fig. 1) to impound water which would be used to irrigate the desert along the river below Victorville. An option was procured to purchase from the Hesperia Land and Water Company the dam site and the lands of the latter company that would be flooded by the reservoir to be formed.

The company failed to carry out the plan and the option, also about 16,000 acres of land along the river below Victorville, were acquired by James Westwater, who proposed to construct a tunnel from the reservoir underneath the mesa and through the San Bernardino Mountains, a distance of 22 miles, to convey part of the stored water to the southern side of the range where it would be used for the development of power and for irrigation, while some of the water was to be used to irrigate the mesa and valley lands along the river below Victorville.

The dam site and the reservoir lands of the Hesperia Company, 2,060 acres, were then purchased by I. R. Wilbur, who, together with Mr. Westwater, obtained also an option to purchase the lands of Rancho Verde that would be flooded. Mr. Wilbur then, together with Eugene de Sabla and others, in about 1908 organized the Mojave Water and Power Company, to which the property was assigned. The option on the Verde lands has been allowed to expire. A right of way was secured from the government to use the unentered land at the rocky points of the dam site for reservoir purposes.

The Victor dam site (Plate V, Fig. 1) is good, the gorge having walls of granite, and the reservoir is open to criticism only for its large area which would probably produce a heavy evaporation loss. The possibility of seepage water detouring around the west end of the dam site is not a serious objection, for some water must of necessity be allowed to flow down the river to satisfy lower riparian owners.

Tests of the underflow[1] in the narrows were made in 1894 by the United States Geological Survey. Velocities of 10 to 96 feet per day were found in the different parts of the cross section. The amount of underflow for the section of 4,160 square feet at an average velocity of 50 feet per day, and assuming the porosity of the sands at 33⅓ per cent was found to be .8 second-foot.

The elevation of the river channel at the dam site is 2,709. The United States Geological Survey made borings[2] in 1899 to determine the position of bedrock and found the maximum depth to the rock to

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[1] Water Supply Paper No. 140, U. S. Geological Survey.

[2] Eighteenth Annual Report of the United States Geological Survey; Twenty-first Annual Report of the United States Geological Survey.

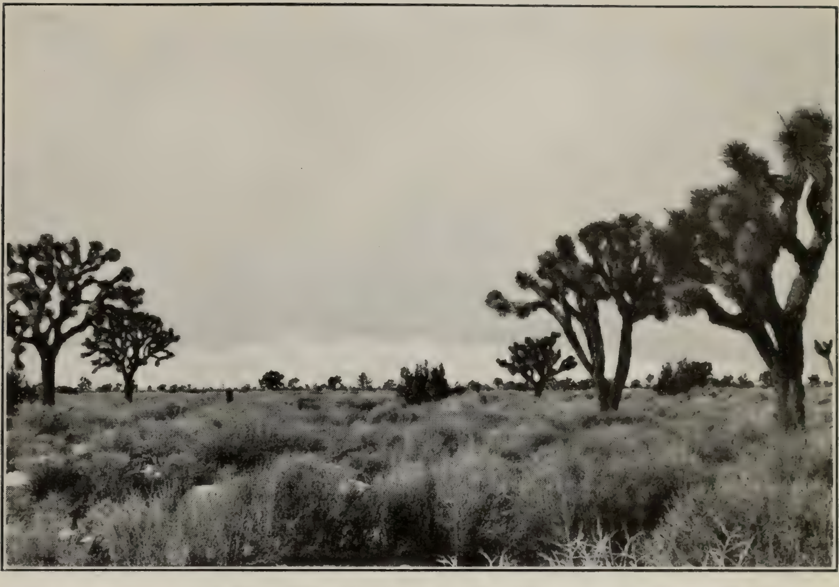

Plate VI, Fig. 1.—West Mesa of Victor Valley, showing yucca and San Gabriel mountains.

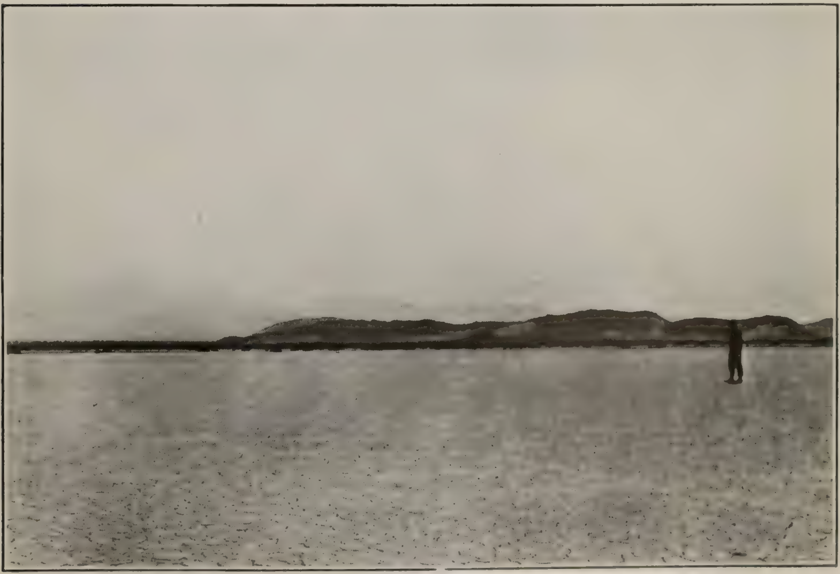

Plate VI, Fig. 2.—Mirage Playa and Grey Mountain.

be 46 feet. The width of the gorge at stream bed is 140 feet and at 145 feet above the stream it is 350 feet. Complete detailed surveys have been made of the dam site and reservoir basin by Mr. Hawgood for the company, from which the following capacities are taken:

80 ft. contour	75,000 acre feet
100 ft. contour	134,000 acre feet
120 ft. contour	218,000 acre feet
130 ft. contour	271,000 acre feet
140 ft. contour	350,000 acre feet

For the site to be utilized several miles of the Santa Fe Railroad would have to be moved to a new location. The railroad company has agreed to move the track to permit the building of the dam and has surveyed an acceptable route entering Victorville farther to the west by way of the arroyo.

The gigantic plan for a tunnel from the reservoir to San Bernardino Valley has been abandoned and it is now contemplated to use all the stored water on the lands on both sides of the river below the reservoir. A canal from the base of the dam would reach the mesa west of the river in a distance of about 12 miles. It is now the intention to construct the dam to about the 130-foot contour which would give an area to the full reservoir of 5,800 acres and a capacity of 271,000 acre-feet. The dam would be 345 feet long on top. According to the discharge measurements of the company and provided the water be not impounded above, also allowing 5 feet for evaporation, enough water can be stored to deliver from 100 to 140 second-feet continuously for 300 days.

Rancho Verde Company.

Rancho Verde includes 3,800 acres in the Mojave River bottom just above the Upper Narows. The first occupation was about 1867 by James Brown, a cattleman who pre-empted land and by 1874 had 1,500 acres fenced and a ditch from the river. Cole and Harris, who acquired the property about 1894, added more land by purchase, constructed another ditch, drilled wells, and started a dairy. They also incorporated Rancho Verde Company and about 1902 sold to the present owners. Until 1912 cattle had been grazed on the surrounding public range as well as on the ranch, but by this time the range was so well occupied by entrymen that the cattle were sold and the ranch has since been producing alfalfa and sugar beets. The owners claim that taxes have been paid on 1,000 miner's inches of water diverted by the ditches since 1869, and to obtain 880 miner's inches from the seven pumped wells and 350 miner's inches from the twelve flowing wells on the ranch. About 1,000 acres are now being irrigated and the ditches cover 1,500 acres, all of which has been irrigated. A portion of the land is riparian. This ranch is the most extensive of the producing properties and the company is the largest user of water on Mojave River.

Daggett Ditch.

The headworks of the Daggett Ditch were begun by the Silver Valley Land and Water Company about 1890. It was then the intention to collect the underflow of the Mojave River and convey it to the Calico mining district north of the river, near Otis (Yermo P. O.). After constructing some works at the ''Fish Ponds,'' near Nebo, the promoters were unable to finance the completion of the enterprise and the work was resumed by the Southern California Improvement Company in 1893, who changed the plan to a ditch on the south side of the river for the purpose of irrigating land near Daggett and Minneola. A submerged dam of sheet piling driven down through the sands of the channel and into the subsurface clay was placed across the river and a tunnel or gathering flume was excavated above this dam to receive the water and deliver it to the ditch. The ditch was constructed from the intake to the Daggett ranch, a distance of four miles, and from there to the town site of Minneola, an additional six miles. The company's activities terminated with bankruptcy. In 1901 a copartnership of four persons undertook the improvement and completion of the works. The headworks which had been damaged by flood were improved, 30-inch concrete pipe was laid in the first mile of the ditch and covered with earth, and the remaining three miles of ditch leading to the Daggett ranch was lined with concrete and covered with boards. The ditch from Daggett to Minneola was abandoned.

The gathering tunnel at the intake is about one-half mile long and is timbered on top and sides. The ditch is claimed to have a capacity of 1,600 miner's inches. By agreement among the owners the Daggett ranch is entitled to the first 200 miner's inches of water secured and only this amount has been developed. An area of 250 acres on the ranch is all that is irrigated regularly under this system. Surface flood water in the river reaching the intake can be turned into the ditch and occasionally some additional land has been irrigated in this manner. The present owners claim to have spent $75,000 and each of the two companies preceding them is said to have spent a larger amount.

Yermo Mutual Water Company.

This system was initiated in 1910 by the Mojave River, Land and Water Company to supply water to about 8,000 acres of land located north of Mojave River and along the Los Angeles and Salt Lake Railroad below Yermo. The land had been acquired by the promoters and was to be sold by them, but in constructing a part of the system they became too heavily burdened with indebtedness to continue. The Yermo Mutual Water Company, a reorganization of the first company, was incorporated in 1916, with $160,000 capital stock, to continue the work. It is claimed that a total of about $200,000 has been spent, of which the greater part was under the first company. The works constructed consist of five 16-inch wells over 400 feet deep, of which two are equipped with 12-inch centrifugal pumps and 50-horsepower engines, three miles of concrete-lined ditch of 1,300 miner's inches capacity below the wells, then four miles of ditch of 3,300 miner's inches capacity, and two lateral ditches. It is the intention to collect underflow from the river channel and to convey it by pipe 4,400 feet to the point of enlargement in the ditch, where it is to be raised to the grade of the ditch by pumping. The company claims that 250 miner's inches can now be delivered from the two pumped wells and that more can be delivered when the settlement demands it by supplying the other wells with pumps. The water is lifted from 50 to 60 feet. Only about 200 acres are being irrigated. It is expected that alfalfa and deciduous fruits will be grown mainly. The enterprise is making but slow growth owing to lack of settlers.

Proposed Enterprises for the Use of Underflow.

Several enterprises for the development of underflow of Mojave River for irrigation have been proposed which have not progressed further than the formality of a stock incorporation and the filing of a claim on water to be appropriated, with possibly the doing of a nominal amount of work with the intention of technically establishing a right to use water relating to the date of the claim. The amount of underground water that can be diverted by gravity is largely a matter of speculation. Success in pumping from wells sunk in or near the channel at favorable locations is more certainly demonstrated. Numerous plants are operating near Hicks, Barstow, Daggett and Minneola, some of which produce good streams of water for irrigating. Several land owners pump from a trench near the river at Helen and they claim to obtain 100 miner's inches with which they irrigate 160 acres of young orchard.

LAND OWNERSHIP AND SETTLEMENT.

The territory considered in this report and shown by the map (Plate I) includes gross agricultural areas as follows:

	Acres	Acres
Mojave River bottom above Victorville		12,000
East Mesa—		
Apple Valley	32,000	
First Bench	4,000	
East of Deadman's Point	8,000	
		44,000
West Mesa—		
Baldy Mesa and Hesperia	100,000	
Sunrise Valley	70,000	
Mirage Valley	64,000	
Along river below Victorville	35,000	
		269,000
Total		325,000

Of this total 12,000 acres are patented unsold railroad grant lands, 47,000 are selected unpatented railroad indemnity lands; 17,000 acres are, or were, state school lands, and 37,000 acres are in control of the Appleton Land, Water and Power Company, the Arrowhead Reservoir and Power Company, and Rancho Verde Company, leaving 212,000 acres of public land, nearly all of which has been applied for under the Homestead and Desert Land Acts.

The railroad lands are owned by the Southern Pacific and the grant relates to the road from Mojave through Barstow to Colorado River, now controlled and operated by the Santa Fe, but which was built by the Southern Pacific about 1884. The line through Cajon Pass and Victor Valley, built by the Santa Fe in 1885, was not a land grant road. The original grant included the Southern Pacific and the Atlantic and Pacific, but the latter did not build across Mojave Desert as was contemplated. The portion of the land that should go to the Southern Pacific was in controversy until 1898 when it was decided that the railroad company was entitled to sections numbered 1, 5, 9, 13, 17, 21, 25, 27, 31 and 33 within the grant limits. The southern limit of the 20-mile strip of the grant crosses Mojave River between Oro Grande and Victorville. The southern edge of the indemnity strip, 10 miles wide outside the grant limits in which the railroad company has selected some of the odd-numbered sections, crosses the river between Victorville and Hesperia. The railroad lands have not been on the market.

Of the land applied for under the national laws, the greater area has been under the Homestead Act and a much larger proportion of the homestead entries have been patented than of the desert land entries.

The Hesperia Land and Water Company, soon after its organization, cleared some of its land of brush and timber and sold the juniper and yucca for wood. About this time many homestead filings were made and the entrymen cut the timber (Plate VI, Fig. 1) and sold wood, hauling it to Hesperia. Soon the government enforced restrictions on the cutting of timber on homestead entries which curtailed this practice and some of the entries were allowed to revert to the government.

Then came years of little activity until the present decade which brought a period of much land filing. The stimulus of the national movement for arid land reclamation, the demonstration of the feasibility of pumping south of the mountains, a better established market for apples and pears, and the activities of speculators were all influences in the rush for the public lands. Although the orchard was generally regarded as the future chief industry of the region, land entries were made for the maximum area allowed under the law and 320-acre desert entries were located where the water furnished by wells is inadequate and where pumping is too expensive for reclamation and the making of final proof.

In 1913 many of the settlers and land entrymen on both sides of the river formed the Victor Valley Mutual Water and Power District Association to secure beneficial measures, the chief one being a government irrigation project. This association was unincorporated and membership was voluntary. The members were assessed on the acre basis to provide funds to carry out the purpose of organization. The association made an urgent appeal to the government for a project to include lands on both sides of the river, but the government, although in sympathy with the end sought, was, owing to the depleted condition of the reclamation fund, unable to render financial aid. The association was instrumental in securing extensions of time for the making of final proof on land entries pending arrangements for an irrigation project to use water from Mojave River, but this offered temporary relief only.

The condition confronting many land entrymen in 1915 was discouraging. Besides the final proofs to be made, numerous small tracts had been planted to orchard on which the trees would, in a few years, need more water than could be supplied by the irrigation facilities. The total area irrigated in Victor Valley is about 7,740 acres, of which only about 2,185 acres are on the mesas.

Table No. 1 gives the areas irrigated in Victor Valley and on Mojave River. The areas irrigated from the river are close approximations and the area irrigated from wells are estimated from partial data. All ditches down to and including the Haws and Robinson are considered as being in Victor Valley.

TABLE No. 1.

Area Irrigated on Mojave River and in Victor Valley.

Division	Area irrigated from river (Acres)	Area irrigated from wells (Acres)	Total acres
River Bottom and First Bench of East Mesa	1,655	3,900	5,555
East Mesa and Lucerne Valley Pass		975	975
West Mesa, including Mirage Valley	310	900	1,210
Totals, Victor Valley	1,965	5,775	7,740
Lowlands	1,130	1,000	2,130
Totals, Mojave River	3,095	6,775	9,870

The Smith Act, which passed congress August 11, 1916, making possible the inclusion of government land in irrigation districts organized under the laws of the states provided such districts do not include a majority acreage of unentered land, opened the way for state irrigation districts in Victor Valley. A district to include 55,000 acres on both the east and west mesas was proposed by the association, but the land entrymen on the east mesa, believing that an independent system for their lands would be cheaper per acre than the more general project, proceeded to secure the organization of the Mojave River Irrigation District for the east side only. Soon the entrymen on the west mesa petitioned for the formation of the Victor Valley Irrigation District for the west side.

One of the main obstacles to progress is the large size of the land holdings. A majority of the entrymen can not finance the improvement of 160 and 320 acres and but few of the irrigated tracts on the mesas exceed 20 acres. If the entries were limited to 40 acres the chances for successful reclamation would be better. Small tracts planted to orchard would give more profit and more value to the land and justify more expense for water than larger tracts for other purposes. At the same time they would require less water per acre, allow a larger district to be irrigated with the water supply and make the cost of the works less burdensome. No disadvantage would be imposed on the actual settler.

MOJAVE RIVER IRRIGATION DISTRICT.

The first petition for the organization of the Mojave River Irrigation District was filed with the board of supervisors of San Bernardino County, November 20, 1916. The board, acting on the advice of the state engineer and being uncertain as to the feasibility of the proposed works and the security that could be offered for a bond issue, denied the petition without prejudice and arranged for an investigation of the conditions to be made in thirty days, intending to take final action after being in possession of facts to enable a more intelligent decision. The petitioners could not, according to law, present a new petition until thirty days had elapsed, but it was not possible for the commission to make the necessary investigations in that time and the petitioners were unwilling to wait for the results. A new petition was then filed February 2, 1917, bearing the signatures of over 75 per cent of the landowners in the proposed district which, under the law, made it obligatory on the part of the supervisors to provide for the organization of the district. When submitted to the voters the proposal for a district carried by a vote of 40 for and none against. The organization was completed April 9, 1917.

The district embraces 27,655 acres, of which 26,874 acres are irrigable. On November 23, 1917, 11,930 acres were patented, 7,120 acres were railroad selected land and the remaining 8,615 acres were practically all entered, 75 per cent of the entered land being under the Homestead Act. It was originally the purpose of this district to purchase the Forks reservoir site of the Arrowhead Reservoir and Power Company, improve the site and construct a conduit 12 miles long of siphon, tunnel and canal to irrigate the greater portion of the district by gravity. Water would then have to be lifted 100 feet to cover the upper or southern portion of the district. Later the plans were changed and the district is now making an endeavor to combine with the Appleton Land, Water and Power Company and other landowners on the west mesa to secure the use of water from Little Bear Valley reservoir. Toward this end the district filed suit October 5, 1917, against the Arrowhead Reservoir and Power Company, and a trustee of stockholders in the company and the holders of options on their property, to condemn their entire properties and water rights.

VICTOR VALLEY IRRIGATION DISTRICT.

The first petition for the Victor Valley Irrigation District was filed May 28, 1917. The action and the reasons for the action taken by the supervisors were exactly the same as with the district for the east side, the petition being denied without prejudice. In compliance with the law a second petition was presented August 3, 1917, with a sufficient number of signatures to make it mandatory for the supervisors to provide for the organization. At the election 44 ballots were cast for and none against the organization, and the district was declared organized October 22, 1917.

The district has a total area of 71,517 acres, of which 65,000 are believed to be irrigable. About the time the organization was completed the boundary included the following classes of land: patented 34,281 acres, railroad selected land 9,417 acres, homestead entries 9,456 acres, and desert entries 18,363 acres. No land of the Appleton Land, Water and Power Company is included.

The district controls three options to purchase all or parts of the properties of the Arrowhead Reservoir and Power Company and of a trustee of stockholders in the company. The options were obtained October 6, 1916, by C. F. Guthridge and held by him for the district to be organized. It was provided that if a district should be organized in four months of the date of the options and that if the district should take steps to exercise the right of purchase, the options were to extend for one year, or to October 6, 1917. The options were made assignable to the district only and were not to be further assigned by the district. By agreement of October 3, 1917, the options were extended to July 1, 1918, and on October 22, 1917, they were assigned by Mr. Guthridge to the district. The options are as follows:

1. For Rancho Las Flores and the agricultural lands below Victorville owned by the trustee of stockholders of the company, $750,000.

2. For all properties, including lands, constructed works, water rights, and rights of way of the company, also the right to construct a dam at the Forks site and to flood the reservoir basin on Rancho Las Flores owned by the trustee, $2,000,000.

3. For all properties of the company without the flooding privilege on Rancho Las Flores, $1,750.000.

It is proposed to exercise both the first and third options and under them to purchase for a total of $2,500,000 all the properties of the company and the trustee. The district proposes to follow one of two plans or a combination of them to carry water to the west mesa. One is for the completion of the Little Bear Valley reservoir (Plate II, Fig. 1) and the inlet works, and the construction of a conduit from the outlet of the reservoir westward across the West Fork of Mojave River and to the west mesa which would cover all land in the district by gravity. This conduit would be 27 miles long and would consist in part of tunnel at the upper end, of inverted siphon across the West Fork and of concrete pipe towards the lower end. A power drop of 810 feet would be utilized at the approach to the siphon.

The other plan is to complete Little Bear Valley reservoir, construct the power conduit to the Forks, improve the Forks reservoir site and provide for lifting the water discharged from this reservoir to the lands above the gravity conduit.

Under a combination of these plans only a part of the water in the Little Bear reservoir would be carried directly to the mesa as under the first plan, and the remainder would be dropped to the Forks reservoir. Power would then be developed on both outlets of the Little Bear reservoir and the water from the Forks reservoir would be used on the lower lands by gravity.

SOILS.

The soils of Victor Valley consist of the materials eroded from the mountains and redistributed in the valley, consequently they do not differ widely in composition but vary more in their relative proportions of sand and clay. The records of wells drilled indicate that an enormous quantity of material has been transported to the plain. The general arrangement of coarse material near the mountains outward to fine in the lower plain is not so noticeable in the surface soils as on many alluvial fans. The migratory character of the stream channels has no doubt disturbed this gradual order to some extent and the winds have also added to the complexity by transporting fine sand and dust.

In general, the higher lands are superior to the lower. That part of the west mesa known as Baldy Mesa, situated above contour 3,400, has more rain, less wind, more even temperature, more vegetation and better agricultural soil than other portions of either mesa. The foothills are covered with a thick growth consisting principally of scrub oak, manzanita and juniper, the latter extending out on the plain two or three miles. Creosote, commonly called greasewood, and sage, desert shrubs, and bunch grass, interpersed with giant yucca (*Clistoyucca arborescens*), are distributed over the entire plain. The yucca, sometimes called the Joshua tree, is peculiar to this desert and to southern Nevada, and its fantastic appearance lends a weird picturesqueness to the region (Plate VI, Fig. 1). The yucca has commercial value for the manufacture of paper, of which it makes a good grade of the manilla kind.

No comprehensive soil survey has been made of Victor Valley, but the reconnaissance for a complete survey is being made by the Bureau of Soils, United States Department of Agriculture. The soils of both mesas are well adapted to agricultural purposes.

For the purpose of studying the moisture requirements of the soils, borings were made on selected parts of the mesas to depths of 6 feet or more and soil samples were taken at each foot in depth. The samples were also used to test some other properties of the soils.

Analyses for alkali content were made of the first foot of soil from different parts of the mesas. All indicated freedom from injurious amounts of salts. No analyses were made of the subsoils, but owing to the fact that the limited amount of water for irrigation in proportion to the irrigable land will operate to make the use of water economical, it is probable that the ground water level will never be raised sufficiently to bring salts in solution to an accumulation at the surface.

Occurring on the surface and in the substrata at different points in the valley are soils containing some carbonate of lime which cements together the materials into a hardpan. It is probable that this hardpan will be softened when there is irrigation.

Soil was encountered in a number of test holes which was coarse yet hard and seemingly impervious. This appeared to consist of angular grains closely packed and held by clay particles. This soil is easily crushed and melts or softens in water without becoming plastic. This type of soil is found in rather large areas on the east mesa, but to a less extent on the west mesa, and this probably accounts for a prevailing exaggerated idea that the soils on the east mesa are much heavier than those on the west mesa. They are in general some heavier but the effect of this characteristic should be to some degree overcome by the application of water.

Table No. 2 shows the amount of organic matter in the surface soil from the different parts of the valley. The organic matter was calculated at 58 per cent of the total carbon which was quantitatively determined.

TABLE No. 2.

Carbon and Organic Content in First Foot of Soil in Victor Valley.

Number of test hole	Kind of field	Location	Per cent of total carbon	Per cent of organic matter
1	2-year orchard	SW. cor., NW. ¼, Sec. 6, T. 4 N., R. 2 W.	.1260	.2172
2	5-year orchard	SW. ¼, NW. ¼, SW. ¼, Sec. 9, T. 4 N., R. 3 W.	.1266	.2172
6	12-year orchard	SW. ¼, SW. ¼, Sec. 30, T. 5 N., R. 3 W.	.1290	.2224
7	12-year alfalfa	NW. ¼, SE. ¼, SW. ¼, Sec. 30, T. 5 N., R. 3 W.	.1455	.2508
12	3-year orchard	NE. cor., SW. ¼, NW. ¼, Sec. 8, T. 5 N., R. 3 W.	.1365	.2353
15	5-year orchard	Center, SE. ¼, Sec. 23, T. 5 N., R. 3 W.	1.6380	2.8270
16	3-year orchard	NE. ¼, NE. ¼, Sec. 24, T. 4 N., R. 6 W.	.3075	.5301
18	1-year orchard	SE. cor., NE. ¼, Sec. 22, T. 4 N., R. 5 W.	.1500	.2586
21	11-year orchard	NE. cor., SE. ¼, Sec. 21, T. 5 N., R. 5 W.	.0795	.1370
22	3-year orchard	NE. cor., NW. ¼, SE. ¼, Sec. 22, T. 5 N., R. 6 W.	.1005	.1733

Excepting the sample from test hole No. 15, which was on subirrigated river bottom land, the soils are deficient in organic matter. This lack may be overcome to some extent by the growing of cover crops which supply humus to the soil, but such crops require some water for their irrigation in addition to that required by the main crop.

No mechanical analyses were made of the soils, but the wilting percentage was determined, and it is a measure of the texture or fineness of particle, the perviousness or degree to which it facilitates the passage of moisture and the porosity or the capacity to hold water. The finer the soil particles the ''heavier'' the soil, the higher the wilting percentage, the greater the quantity of water the soil must contain to support plant growth, the greater the capacity to hold water and the slower the movement of water in the soil. Although the rate of movement is slower, the final reach of capillarity is farther in the heavy soils than in the lighter soils. The loss of moisture by evaporation should be greater from the finer textured soils.

The tests to determine the amount of moisture that should be maintained in the soils to sustain plant growth are useful in comparing the two mesas as to their relative requirements of water. This study was made according to the method developed and used by the Bureau of Plant Industry of the United States Department of Agriculture. The purpose was to determine what is designated as the wilting percentage of the soils. This term is expressed in percentage by weight on the basis of the weight of the dry soil and it may be defined as the percentage of moisture in the soil below which, if the moisture drops, the plants will wilt. It has been determined by experiment that the finer the texture of the soil the greater the percentage of this unavailable moisture. It is apparent that for good plant growth and profitable crop production the moisture should not be allowed to fall below the wilting percentage during the growing season. The wilting percentage, if multiplied by 1.84, gives what is known as the moisture equivalent. The percentage of moisture which corresponds to this is that usually found in the soil after an irrigation and probably may be considered an optimum.

Tables No. 3 and No. 4 give the wilting percentages and the moisture equivalents for soils tested from the east and west mesas. The amounts of water necessary in the soil to prevent wilting of plants and to satisfy the moisture equivalent shown in the two last columns were calculated on the basis of an assumed volume weight of soil of 90 pounds per cubic foot.

TABLE No. 3.

Wilting Percentages and Moisture Equivalents for Six Feet of Soil on East Mesa.

Number of test hole	Location	Average wilting percentage	Average moisture equivalent in per cent	Acre feet per acre to prevent wilting	Acre feet per acre for moisture equivalent
1	SW. cor., NW. ¼, Sec. 6, T. 4 N., R. 2 W.	5.4	9.8	.462	.846
2	SW. ¼, NW. ¼, SW. ¼, Sec. 9, T. 4 N., R. 3 W.	6.1	11.1	.521	.959
3	SW. ¼, NW. ¼, SW. ¼, Sec. 9, T. 4 N., R. 3 W.	3.6	6.6	.309	.570
6	SW. ¼, SW. ¼, Sec. 30, T. 5 N., R. 3 W.	8.6	15.8	.743	1.145
11	SE. cor., Sec. 22, T. 5 N., R. 3 W.	3.0	5.5	.258	.474
12	NE. cor., SW. ¼, NW. ¼ Sec. 8, T. 5 N., R. 3 W.	7.2	13.0	.617	1.124
13	SE. cor., SW. ¼, NW. ¼, Sec. 8, T. 5 N., R. 3 W.	9.6	17.7	.838	1.529
14	SW. ¼, SW. ¼, Sec. 33, T. 5 N., R. 3 W.	4.3	8.0	.374	.691
	Average	6.0	10.9	.515	.917

TABLE No. 4.

Wilting Percentages and Moisture Equivalents for Six Feet of Soil on West Mesa.

Number of test hole	Location	Average wilting percentage	Average moisture equivalent in per cent	Acre feet per acre to prevent wilting	Acre feet per acre for moisture equivalent
16	NE. ¼, NE. ¼, Sec. 24, T. 4 N., R. 6 W.	6.1	11.1	.522	.959
17	SW. cor., SW. ¼, Sec. 18, T. 4 N., R. 5 W.	4.4	8.0	.377	.691
18	SE. cor., NE. ¼, Sec. 22, T. 4 N., R. 5 W.	5.8	10.6	.497	.914
19	SE. cor., NW. ¼, Sec. 22, T. 5 N., R. 5 W.	6.3	11.5	.542	.994
21	NE. cor., SE. ¼, Sec. 21, T. 5 N., R. 5 W.	3.1	5.8	.272	.497
22	NE. cor., NW. ¼, SE. ¼, Sec. 22, T. 5 N., R. 6 W.	8.1	15.3	.710	1.322
24	SW. cor., NW. ¼, Sec. 4, T. 5 N., R. 6 W.	5.2	9.6	.464	.838
25	SE. cor., NE. ¼, Sec. 23, T. 6 N., R. 7 W.	3.0	5.5	.261	.474
	Average	5.3	9.6	.456	.836

In sampling it was noticed that in all except No. 14, which was in an unirrigated orchard on Baldy Mesa, the soil was dry below the third or fourth foot.

The test for the first 6 feet of soil in eight holes on the east mesa gave wilting percentages ranging from 3.0 to 9.6 per cent, with an average of 6.0 per cent. Similar tests for eight holes on the west mesa gave wilting percentages ranging from 3.0 to 8.1 per cent with an average of 5.3 per cent. The number of acre-feet of water per acre that would have to be put into the upper 6 feet of soil on the east mesa to produce a moisture percentage above the wilting point is .52, and the number of acre-feet to produce the same result on the west mesa is .46. It is assumed that a depth of 6 feet of soil is sufficient for the penetration of roots of deciduous fruit trees. The surface soil on the east mesa in considerable areas is ''heavier'' than that on the west mesa where the "heavier'' textured soil is more in spots. This theoretical comparison indicates that the soils of the east mesa would require but slightly more water than those of the west mesa.

These results do not show the duty of water nor give data from which the duty of water may be determined. They merely compare the soils as to moisture requirements. They do not show how rapidly the moisture, if once supplied, would be depleted by the action of nature nor how frequently and in what amounts water would have to be supplied to maintain the required moisture percentages. These studies take account of soils only and do not give consideration to other important factors affecting duty of water.

CLIMATE.

In a study of duty of water due consideration must be given to elevation and topography as affecting precipitation, temperature and wind as affecting evaporation, and to the possibility of deep percolation.

Table No. 5 gives the maximum and minimum temperatures recorded at the ranch of Dr. G. W. Dobie, centrally located on the west mesa.

TABLE No. 5.

Temperatures in Degrees Fahrenheit at Dobie Ranch, Victor Valley.

	1909		1910		1911		1912		1913		1914		1915		1916	
	Maximum	Minimum	Maximum	Minimum	Maximum	Minimum	Maximum	Minimum	Maximum	Minimum	Maximum	Minimum	Maximum	Minimum	Maximum	Minimum
January	70	26	68	12	60	16	68	14	64	12	66	22	58	24	65	18
February	66	26	69	12	58	19	68	18	67	21	64	26	62	28	75	19
March	72	25	84	30	84	24	67	29	85	20	76	30	74	34	88	30
April	89	38	94	34	84	24	78	29	93	32	82	33	86	30	91	39
May	98	40	109	33	86	35	92	38	97	28	97	38	98	40	96	36
June	106	47	105	42	106	42	106	42	100	40	106	----	105	42	109	40
July	111	49	108	46	106	52	106	46	108	50	106	----	----	----	103	47
August	102	52	106	54	107	50	103	50	106	50	110	----	106	61	----	----
September	102	40	100	50	102	43	98	40	98	38	96	----	102	42	----	----
October	83	44	91	34	78	36	----	----	86	28	86	----	94	40	----	----
November	76	30	78	26	74	16	70	30	74	22	72	22	89	18	----	----
December	67	12	68	24	64	14	58	14	60	20	50	16	70	18	66	16

The highest temperature in the foregoing table is 111° which occurred in July. The lowest, 12°, occurred several times in the months of December, January and February. The lower parts of the valley have greater and the higher parts less extremes of temperature. The minimum winter temperature at Victorville has fallen below zero on occasions.

The annual rainfall in Victor Valley varies from about 15 inches at the foothills to about 5 inches at Victorville. The clouds come from the south or southwest and they enter the valley through Cajon Pass and by crossing over the mountains on either side of the pass. They are sometimes turned westward from Cajon Pass and this probably accounts for a precipitation on Baldy Mesa that is greater than would be accounted for by elevation alone. Generally an annual rainfall of 8 or 9 inches is required to satisfy the immediate surface run-off and the evaporation from the soil and the precipitation must generally exceed this amount for any considerable quantity of moisture to be retained in the soil long enough to produce other than characteristic desert vegetation. This appears to hold true for this locality where the greater precipitation on Baldy Mesa produces the heavier and more varied plant forms of the Juniper belt.

Table No. 6 gives the only measurements of precipitation that have been kept long enough to be of value.

TABLE No. 6.

Precipitation in Victor Valley.

Season	Forks, elevation 3,000 feet (Inches)	Hesperia, elevation 3,190 feet (Inches)	Dobie Ranch, elevation 3,130 feet (Inches)	Rancho Verde, elevation 2,760 feet (Inches)	Victorville, elevation 2,726 feet (Inches)	Barstow, elevation 2,150 feet (Inches)
1904–1905	----------	12.42	----------	----------	6.70	5.90
1905–1906	14.94	4.78	----------	6.71	5.89	1.80
1906–1907	25.77	13.44	----------	10.72	8.61	----------
1907–1908	9.14	9.33	----------	6.28	5.75	7.03
1908–1909	9.94	5.21	3.35	5.19	4.94	4.81
1909–1910	17.14	8.99	2.85	6.16	4.47	4.16
1910–1911	11.75	8.21	3.84	5.72	3.25	2.90
1911–1912	----------	----------	3.77	5.82	----------	3.31
1912–1913	----------	----------	3.50	2.72	----------	----------
1913–1914	----------	----------	6.76	7.27	----------	----------
1914–1915	----------	----------	6.91	----------	----------	----------
1915–1916	----------	----------	3.40	----------	----------	----------
Average	14.75	8.91	4.30	6.29	5.66	4.27
Number of seasons	6	7	8	9	7	7

The variation in annual precipitation at the several stations is graphically shown by the diagram Fig. 1.

Unfortunately no records of rainfall have been kept for periods of several years on the east mesa but such meagre records as are available indicate the rainfall to be less than on the west mesa. This difference has been observed by residents of the valley and it is also shown by the vegetation.

Almost no rain falls in June and July and about 75 per cent of the total annual precipitation occurs in December to April, inclusive. Some snow falls in winter, especially on the upper slopes of the plain. The monthly distribution of the annual precipitation at the Dobie Ranch is shown by Table No. 7, also by the diagram Fig. 2.

TABLE No. 7.

Monthly Precipitation at Dobie Ranch.

Month	1912-13 (Inches)	1913-14 (Inches)	1914-15 (Inches)	1915-16 (Inches)	Mean 1908-09	(Inches) 1909-10	(Inches) 1910-11	(Inches) 1911-12	Mean (Inches)
July	-------	0	0	0	0	.30	0	-------	.04
August	-------	.90	.05	0	0	.13	0	·0	.13
September	.40	0	0	1.74	1.01	0	0	0	.39
October	.76	0	0	.10	-------	0	.36	0	.15
November	0	.15	.10	0	.18	.67	.22	.10	.18
December	.38	1.18	.03	.15	0	.08	2.23	.22	.53
January	.60	.32	1.38	0	.87	3.17	1.19	2.56	1.26
February	.20	0	1.48	0	1.26	1.03	2.18	.36	.81
March	1.01	.30	.61	1.48	.08	.05	.07	.05	.46
April	0	0	.18	.30	0	1.23	.40	0	.26
May	0	0	.01	0	0	.10	.26	.11	.06
June	0	0	0	0	.10	0	0	0	.01
Season	3.35	2.85	3.84	3.77	3.50	6.76	6.91	3.40	4.27

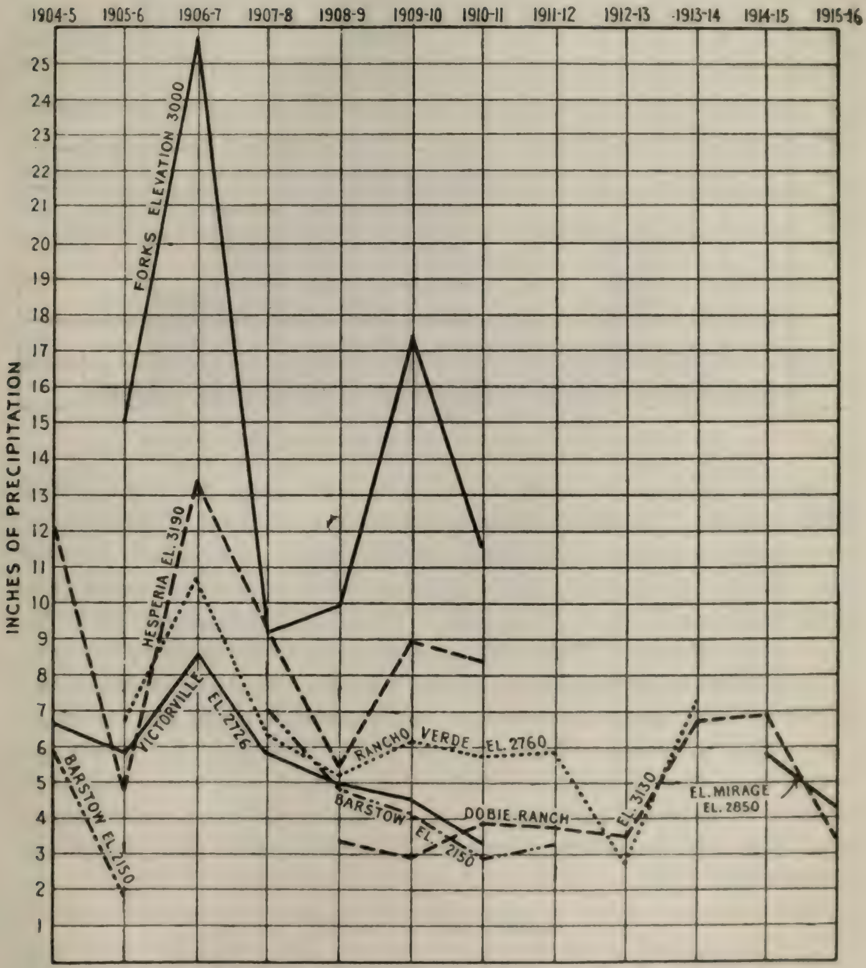

Fig. 1.—Diagram of comparison of annual precipitation at stations in Victor Valley.

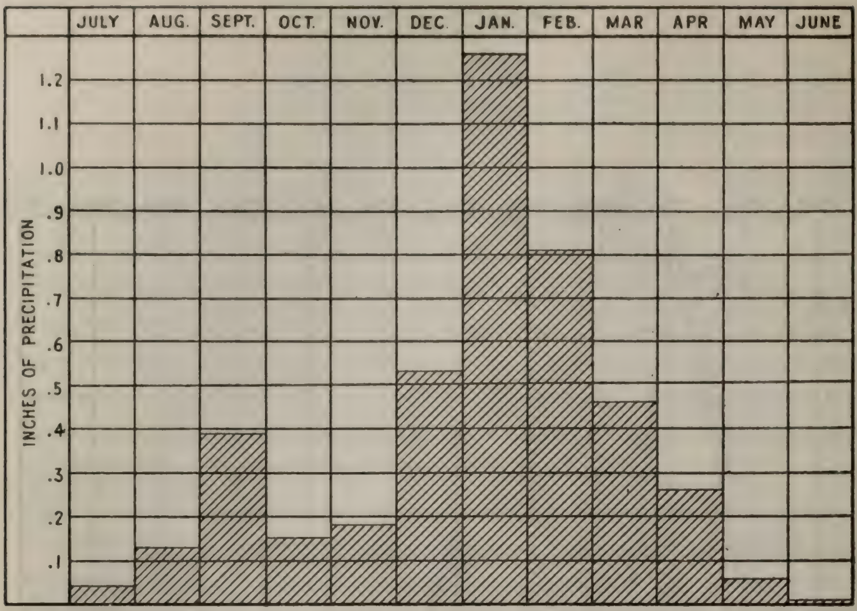

Fig. 2.—Diagram of mean monthly precipitation at Dobie Ranch.

This is a region of much wind. The prevailing direction is from south of west. The Baldy Mesa is most free from wind. The stronger air currents occur more frequently in the spring. The winds, together with the dry atmosphere, should produce high evaporation losses from either water surfaces or wetted soils. The Fourth Annual Report of the Los Angeles Board of Water Commissioners gives the evaporation from a water surface in this section at 56.40 inches for June to December, inclusive, 1898, and an estimate of 86.55 inches is given for the entire year. The Arrowhead Reservoir and Power Company has found the evaporation from Little Bear Valley Reservoir in the mountains to be from 30 to 36 inches per annum. A comparison of these records shows the effect of the desert atmosphere, temperatures and winds on evaporation.

DUTY OF WATER.

An advantage is to be gained by selecting crops such as apples and pears that are not only suited to soil and climate of Victor Valley, but which also have high commercial value and require little water. It is, in fact, imperative that the greater part of the land to be under any irrigation system on either mesa grow crops that permit both a high duty of water and a high cost of irrigation per acre in order that the project be financially feasible. It is assumed that a small portion of the land would produce alfalfa and vegetables but the proportion of these should not be large. Alfalfa in this region would require more than double the amount of water required by deciduous fruits and the area served by the water available if planted to alfalfa would then be less than half the area that could be served if planted to orchard. Finally, the cost per acre of the works for alfalfa would practically be double that for orchard for the cost of the distributing system on the mesa would be small in proportion to that of the mountain works which latter cost would be the same in either case.

No attempt was made to systematically collect information on the duty of water for alfalfa for this report as was done for duty for deciduous fruits, but opportunity was given in the course of the investigation to obtain some miscellaneous data which are presented for what they are worth in Table No. 8.

TABLE No. 8.

Duty of Water for Alfalfa.

Number of tract	Locality	Acres	Acre feet	Acre feet per acre
1	Mojave River bottom	60	960.00	16.00
2	Mojave River bottom	66	1,040.82	15.77
3	East Mesa	40	274.40	6.89
4	West Mesa	5	6.20	1.24
5	West Mesa	25	100.00	4.07
6	Lucerne Valley	18	39.60	2.20
7	Lucerne Valley	40	109.20	2.73
8	Lucerne Valley	17	46.24	2.72
9	Perris Valley	75	421.50	5.62
10	Perris Valley	50	303.50	6.07
11	Perris Valley	30	191.70	6.39
12	Perris Valley	50	275.00	5.50
	Totals and average	476	3,768.16	7.92

The average 7.92 acre feet per acre is obtained by dividing the total number of acre feet, 3,768.16, by the total number of acres, 476, which gives weight in the average to the several tracts according to area. Eliminating tracts numbers 1 and 2, which are in the river bottom where the soil is sandy and the water plentiful and cheaply applied, the average is 5.72 acre feet per acre which amount is believed more than is necessary for alfalfa in Victor Valley.

A better idea of the amount of water required for irrigating alfalfa may be had from consideration of two of the larger alfalfa growing sections of southern California, Imperial Valley and Chino, the one more arid and the other less arid than Victor Valley. The water used in Imperial Valley flows by gravity from Colorado River and is plentiful and cheap. That used at Chino is pumped from wells with lifts up to 125 feet and is expensive. The fields in Imperial Valley are flooded by the border check method and those at Chino are flooded by surface pipe. The duty of water for alfalfa in these localities is shown by Table No. 9.

TABLE No. 9.

Duty of Water for Alfalfa in Imperial Valley and at Chino.

Locality	Number of crops	Rainfall in acre feet per acre	Irrigation in acre feet per acre	Total water in acre feet per acre	Irrigation per crop in acre feet per acre	Total water per crop in acre feet per acre
Imperial Valley	8	.25	4.00	4.25	.50	.53
Chino	6	1.25	2.50	3.75	[1].50	.62
			3.25	4.00	.50	.57

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[1] The first crop at Chino is unirrigated.

Four crops and sometimes a light or partial fifth crop of alfalfa are cut per annum in Victor Valley. If .5 foot in depth of water be applied to produce each crop the total amount that would be required is 2 or 2.5 acre feet per acre.

Apple and pear orchards in Victor Valley have generally been irrigated four times per annum, the first being in April or May and the last in October. In some cases a fifth irrigation has been given in November. Most of the orchards appear to have had insufficient water and it is probable that under an efficient irrigation system the practice would be to give five irrigations, unless rain is plentiful in the first half of the winter.

In order to arrive at a proper duty of water for deciduous fruits data were obtained on the use of water on all orchards in Victor Valley where the amount applied was measured or where records of value were kept. Data were also secured on orchards in other sections of southern California where somewhat similar conditions obtain. The elevation and climate of the settlements on the north side of the Sierra Madre range, including Victor Valley, closely resemble. Some of those on the south side differ more from Victor Valley in certain respects as with reference to precipitation at Beaumont and Yucaipa and to plentiful water supply at Banning, but they are in general comparable. Other things being equal, records from Victor Valley should be given more weight than records from other sections, and data on mature orchards more truly indicate the amount of water that would eventually be required on the mesa, but, unfortunately, there are as yet only a few producing orchards in Victor Valley, so that the records from the greater number of older orchards in the other deciduous fruit sections must be relied upon to a large extent.

The results for each of the localities investigated are given in the following tables. The average duty of water in acre-feet per acre for each locality is determined from the total number of acres and the total amount of water applied, thereby giving weight according to acreage in making the average.

TABLE No. 10.

Mojave River Bottom.

Duty of Water for Deciduous Orchards. Mojave River Bottom.

Number of tract	Kind of orchard	Age of trees	Acres	Acre feet	Acre feet per acre
1	Apples	20	15	38.25	2.55
2	Pears	1	6	11.88	1.98
	Totals and average		21	50.13	2.39

East Mesa.

Number of tract	Kind of orchard	Age of trees	Acres	Acre feet	Acre feet per acre
3	Apples	12	30	171.60	5.72
4	Apples	3	140	61.60	.44
5	Apples and pears	3–5	75	62.25	.83
6	Apples and pears	4	75	123.75	1.65
7	Apples and pears	4	40	28.00	.70
8	Apples and pears	1–2	54	71.80	1.23
9	Apples and pears	1–2	40	39.60	.99
10	Apples and cherries	3	56	39.76	.71
	Totals and average		510	598.36	1.17

West Mesa.

Number of tract	Kind of orchard	Age of trees	Acres	Acre feet	Acre feet per acre
11	Apples	20	10	8.10	.81
12	Apples	20	8	2.88	.36
13	Apples	20	12	12.36	1.03
14	Apples	20	20	18.20	.91
15	Apples	20	20	29.80	1.49
16	Apples	4	30	6.90	.23
17	Apples	1–6	10	2.00	.20
18	Apples and pears	3	55	28.60	.52
19	Apples	4	40	8.80	.22
20	Apples	2	20	4.40	.22
21	Pears	3	40	8.80	.22
	Totals and average		265	130.84	.49

Lucerne Valley.

Number of tract	Kind of orchard	Age of trees	Acres	Acre feet	Acre feet per acre
22	Apples	3	8	2.48	.31
23	Apples and pears	3	20	16.60	.83
24	Pears	2	40	40.80	1.02
	Totals and average		68	59.88	.88

Yucaipa.

Number of tract	Kind of orchard	Age of trees	Acres	Acre feet	Acre feet per acre
25	Peaches	10	6	17.34	2.89
26	Apples	8–12	3	8.67	2.89
27	Apples	4	10	3.60	.36
28	Apples, cherries, pears	4–20	20	35.60	1.78
	Totals and average		39	65.21	1.67

San Timeteo Canyon.

Number of tract	Kind of orchard	Age of trees	Acres	Acre feet	Acre feet per acre
29	Peaches	6	20	7.20	.36
30	Apricots	20	15	7.20	.48
	Totals and average		35	14.40	.41

Perris Valley.

Number of tract	Kind of orchard	Age of trees	Acres	Acre feet	Acre feet per acre
31	Apricots	1	10	4.20	.42
32	Apricots	3	10	6.80	.68
33	Apricots	1	10	9.40	.94
	Totals and average		30	20.40	.68

Beaumont.

Number of tract	Kind of orchard	Age of trees	Acres	Acre feet	Acre feet per acre
34	Apples	4–7	100	42.00	.42
35	Apples	3–6	10	3.60	.36
36	Apples, peaches, pears	5–8	8	2.88	.36
37	Apples	5	5	2.40	.48
38	Apples, pears, cherries	5	5	1.20	.24
39	Apples	7	5	1.80	.36
40	Apples and cherries	5	11	2.42	.22
41	Cherries, pears, apples, peaches	5	5	1.20	.24
42	Apples	5	5	1.80	.36
43	Apples	5	5	1.80	.36
44	Apples, pears, peaches, cherries	7	5	.85	.17
45	Apples	3	8	3.60	.45
	Totals and average	----------	172	65.55	.38

Banning.

Number of tract	Kind of orchard	Age of trees	Acres	Acre feet	Acre feet per acre
46	Apricots and almonds	Over 5	15	16.05	1.07
47	Apricots, peaches, almonds	25	20	31.80	1.59
48	Apricots and peaches	8	15	29.70	1.98
49	Apricots, peaches, almonds	6–9	20	12.00	.60
50	Apricots	5	8	19.68	2.46
51	Apricots	20	10	19.80	1.98
52	Peaches, prunes, apricots, almonds	15	10	23.80	2.38
52	Peaches and almonds	8–20	40	95.20	2.38
	Totals and average	----------	138	248.03	1.80

Summary.

Locality	Number of orchards	Total acres	Total acre feet	Acre feet per acre
Mojave River bottom	2	21	50.13	2.39
East Mesa	8	510	598.36	1.17
West Mesa	11	265	130.84	.49
Lucerne Valley	3	68	59.88	.88
Yucaipa	4	39	65.21	1.67
San Timeteo Canyon	2	35	14.40	.41
Perris Valley	3	30	20.40	.68
Beaumont	12	172	65.55	.38
Banning	8	138	248.03	1.80
Totals and average	53	1,278	1,252.80	.98

The average amount of water applied to the 53 orchards representing a combined area of 1,278 acres giving proper weight to the area of each orchard is .98 acre-foot per acre. This summary includes orchards of all ages. The results when segregated for trees under 5 years of age and over 5 years of age are shown by Tables No. 11 and No. 12.

TABLE No. 11.

Summary for Orchards Under Five Years of Age.

Locality	Number of orchards	Total acres	Total acre feet	Acre feet per acre
Mojave River bottom	1	6	11.88	1.98
East Mesa	7	480	426.76	.89
West Mesa	6	195	59.50	.31
Lucerne Valley	3	68	59.88	.88
Yucaipa	1	10	3.60	.36
San Timeteo Canyon	0	0	0	
Perris Valley	3	30	20.40	.68
Beaumont	2	18	7.20	.40
Banning	0	0	0	
Totals and average	23	807	589.22	.73

TABLE No. 12.

Summary for Orchards Over Five Years of Age.

Locality	Number of orchards	Total acres	Total acre feet	Acre feet per acre
Mojave River bottom	1	15	38.25	2.55
East Mesa	1	30	171.60	5.72
West Mesa	5	70	71.34	1.02
Lucerne Valley	0	0	0	
Yucaipa	3	29	61.61	2.12
San Timeteo Canyon	2	35	14.40	.41
Perris Valley	0	0	0	
Beaumont	10	154	58.35	.38
Banning	8	138	248.03	1.80
Totals and averages	30	471	663.58	1.41

The average used on 23 orchards representing 807 acres of trees under 5 years is .73 acre-foot per acre and the average for 30 orchards representing 471 acres in trees over 5 years is 1.41 acre-feet per acre. This latter group includes an orchard in the river bottom at Oro Grande, tract No. 1, and the Victor Ranch on the first bench, tract No. 3, which are not representative of conditions on the mesas and for which the duty of water is excessively low. Eliminating these the average for the orchards over 5 years of age with a combined area of 426 acres is 1.07 acre-feet per acre. Most of the orchards in Victor Valley appear to have had insufficient water for vigorous growth and production.

The results for the individually owned orchards are supplemented by figures on the gross duty of water for the areas served by several irrigation systems delivering water principally for deciduous fruit trees as given by Table No. 13. The figures, except for the Banning Water Company, are from measurements. The duty for the Beaumont Land and Water Company is for 1913 and that for the Lake Hemet Water Company is an average of several seasons. The duty for the other systems is for 1916.

TABLE No. 13.

Duty of Water for Deciduous Orchards Under Irrigation Systems.

Irrigation system	Kind of trees	Acres	Rainfall in feet	Irrigation in feet	Total water in feet
Yucaipa Water Co. No. 1	Apples, cherries, etc.	2051	1.50	.53	2.03
Beaumont Land & Water Co.	Miscellaneous deciduous	1065	1.66	.12	1.78
Banning Water Co.	Miscellaneous deciduous	2700	1.10	1.47	2.57
Lake Hemet Water Co.	Deciduous and citrus	5600	1.00	1.10	2.10
Palmdale Water Co.	Pears	200	.50	.75	1.25
Little Rock Creek Irri. Dist.	Pears	1500	.60	.85	1.45
Average				.80	1.86

The Yucaipa Company delivers to orchards of all ages and the water supply has been adequate. Although the precipitation at Beaumont is high the amount given for the system is considered insufficient for the locality. The duty for the Banning Company is based on the amount of water available for use, 11 second-feet, for six months. The amount actually used may have been less. This company has a plentiful supply and it is probable that more water is used than is necessary. Most of the Hemet orchards are decidous but some are in citrus fruits. The trees at Palmdale are young and more water should be used when they become mature. Only about 200 acres of the total area given for the Little Rock district were of full bearing age in 1916 and the amount used in this district should increase in the future.

The average amount of water applied under these irrigation systems is .80 acre-foot per acre and the average total, including rainfall, is 1.86 acre-feet per acre. To give the equivalent of this latter amount in Victor Valley it would be necessary to apply 1.36 feet of irrigation water assuming an average rainfall of .5 foot per annum.

The only records of rainfall on the east mesa are for such short periods as to be of little value for comparison. However, it is believed that the east mesa, being on the average about 200 feet lower than the west mesa, has less rainfall and that the amount of water should be from 10 to 20 per cent greater than for the west mesa. It is recommended that the duty of water be estimated at 1.25 acre-feet per acre for the west mesa and 1.50 acre-feet per acre for the east mesa. No allowance is made for loss in distribution, but neither is any account taken of the land that would be devoted to buildings and which would not require irrigation.

One miner's inch flowing continuously for a season of 200 days is equivalent to a depth of 1.25 feet on 6.40 acres, and a depth of 1.50 feet on 5.33 acres.

WATER RIGHTS.

The first irrigation ditches on Mojave River were constructed in the early seventies below and near the Lower Narrows. In a few years others were constructed on the West Fork and near the Upper Narrows. It appears that the early irrigators relied mainly on the use of the water to establish their priorities and for some of the ditches did not accompany their appropriations with the formality of filing until after the ditches had been used, while for other ditches they never filed. On the other hand, as with most streams of the arid country, many claims have been recorded which did not materialize by the construction of ditches and use of water. It is estimated from a review of the county water records that several hundred such filings have been made on the Mojave. Probably the one of most liberal conception was a promoter's claim for 1,000,000 miner's inches to be diverted from the river near Hicks by a canal to be 400 feet wide on top, 250 feet wide on the bottom, 10 feet deep, and to have a grade of 3 feet per mile, for irrigating 10 townships (230,400 acres) of land below Daggett.

The earliest claim recorded is dated April 21, 1861, and is for the entire river down to bedrock for 3 miles near the mill-site at Flat Salt Springs. This and other claims filed in the sixties were for mining purposes. The first recorded claim for an irrigation ditch that was constructed and used was for the Lane & Riley Ditch in 1872. Next came the Houlton filing on the West Fork and the Pearl filing on the main river in 1873. These are followed by the filing for the Rogers Ditch in 1876. The filings for most of the other ditches so located as to have a sufficient supply of water every year had been made by 1885.

Table No. 14 associates the filings as identified from the records and other essential data with the original and present names of the ditches, the list being in order of location downstream. Several of the older ditches were abandoned, in some cases the water right being exercised through other ditches. Others have been changed as to location of intake with the shifting of the river channel and a few have been relocated throughout.

Under an act of the legislature of 1864 and applying to San Bernardino County only, the county maintained a board of water commissioners for a number of years to administer the waters of the streams, an institution fashioned after that of the early Mormon communities in Utah. The commissioners were to ''locate'' ditches and to apportion the water in them annually. They annually selected a water master for each ditch to make the apportionment and the reports of the water masters to the board are a matter of record. The main activities of the commissioners related to the more populous settlements on the Santa Ana River and tributaries, but in 1879, acting on petition of residents, they gave attention to irrigation on Mojave River. On January 15th of that year they met on the banks of the river and located six ditches near the Lower Narrows, assigning to them names and numbers and alloting to them amounts as shown by the table. The basis of the numbering is not made clear and the order is probably arbitrary. The numbers are not according to location and they are not understood to represent priorities. Several other ditches were in use on other parts of the river at this time.

TABLE

Data on Ditches

Original or former name of ditch	Allotment by county water commissioners			Claim of appropriation		
	Number of ditch	Date	Amount miner's inch	Claimants	Date	Amount miner's inch
Upper West Fork	------	------	------	Amos Houlton	May 30, '73	800
				C. A. Burcham	Jan. 27, '83	2,000
Lower West Fork	------	------	------	J. F. Houghton	Jan. 9, '82	10,000
				C. A. Burcham	Jan. 16, '92	10,000
Grass Valley Creek	------	------	------	C. A. Burcham	Jan. 6, '85	5,000
Lang	------	------	------	Wm. R. Lang	Mar. 18, '11	500
Hesperia	------	------	------	Hesperia Land & Water Co.	Aug. 13, '85	5,000
East Fork	------	------	------	C. A. Burcham	June 27, '83	10,000
Laughlin	------	------	------	Sanford C. Laughlin	Jan. 2, '09	1,500
Cole	------	------	------	A. W. Cole	(No filing)	------
Cory	------	------	------	E. L. Horton and J. C. Cory.	Feb. 20, '07	1,000
Carden	------	------	------	H. G. Carden	May 7, '07	500
Upper Brown	------	------	------	Jas. Waters Jr, and Jas. Brown.	Oct. 28, '82	1,000
Lower Brown	------	------	------	John Brown	(No filing)	------
Rogers	------	------	------	Samuel Rogers and Wm. Ross.	Jan. 31, '76	1,000
Allison	------	------	------	A. J. Spencer	Jan. 10, '80	2,000
Atwood	------	------	------	------	(No filing)	------
Mill	------	------	------	Hallock, Congar, Clancey and Goldsworthy.	Oct. 15, '80	4,000
Hulday Pearl	2	Jan. 15, '79	100	Hulday Pearl	(No filing)	------
Foote	4	Jan. 15, '79	500	Geo. E. Foote	(No filing)	------
Pioneer	1	Jan. 15, '79	300	Atkinson, Lane, Swarthout and Bemis.	April 17, '85	800
Wild Goose	6	Jan. 15, '79	300	Riley, Decrow and Snodderly.	(No filing)	------
A. H. Pearl	------	------	------	A. H. Pearl	July 25, '73	whole river
Lane & Riley	3	Jan. 15, '79	100	A. G. Lane	Oct. 22, '72	400
Snodderly & Decrow	5	Jan. 15, '79	------	E. Snodderly and Geo. Decrow.	(No filing)	
Bledsoe & Robinson	------	------	------	J. B. Bledsoe and J. D. Clark.	April 30, '83	------
				Bledsoe, Clark, Robinson and Boren.	Oct. 6, '83	600
				Francis A. Haws	Dec. 15, '83	600
McNew	------	------	------	Jerry McNew	(No filing)	------
Boren & Schneidewidt	------	------	------	M. J. Tiney and F. S. Schneidewidt.	Jan. 20, '95	150
Wilson	------	------	------	J. A. Wilson	Oct. 13, '09	500
Hartman	------	------	------	H. Hartman	Dec. 23, '84	1,000
Swarthout	------	------	------	G. M. Swarthout and J. T. Bennette.	Dec. 18, '07	800
Richardson	------	------	------	Richardson and Talmadge.	Jan. 16, '03	1,000
Decrow & Scoble	------	------	------	Durell, Decrow and Scoble.	Oct. 28, '09	1,500
Anchiniachie	------	------	------	J. T. Anchiniachie	Aug. 28, '06	600
Cobb	------	------	------	Chapman, Cobb and Chilson.	Oct. 17, '07	4,000
Stonical	------	------	------	------	(No filing)	------
Harland	------	------	------	R. A. Harland and D. T. Chilson.	Mar. 22, '15	200
Minneola	------	------	------	Wm. Deterle	Sept. 28, '93	100,000
Elmholt	------	------	------	Mojave River Land and Water Co.	Sept. 27, '10	20,000

No. 14

in Victor Valley

Decreed rights			Present ownership			Remarks
Name under which decreed	Date	Amount miner's inch.	Name of ditch	Names of owners	Area irrigated	
-----	-----	-----	Los Flores No. 1	Victor C. Smith	200	
-----	-----	-----	Los Flores No. 2	Victor C. Smith		
-----	-----	-----	Los Flores No. 3	Victor C. Smith		
-----	-----	-----	Lang	Wm. R. Lang	50	
-----	-----	-----	Hesperia	Appleton L., W. & P. Co.	310	
-----	-----	-----	Lower Deep Creek	Appleton L., W. & P. Co.	45	
-----	-----	-----	Laughlin	Laughlin & Lauffer.	95	
-----	-----	-----	Cole	A. W. Cole	30	
-----	-----	-----	Lewis	C. C. Lewis and I. B. Miller.	40	
-----	-----	-----	Carden	H. G. Carden	75	
-----	-----	-----	Upper Verde	Rancho Verde Co.	400	
-----	-----	-----	Lower Verde	Rancho Verde Co.		
Rogers	Dec. 24, '88	800	Rogers	Heirs of Samuel Rogers.	80	Hesperia L. & W. Co. vs. Rogers.
-----	-----	-----	Driscoll	Victor C. Smith	75	Allison and Atwood combined. For ore mill.
-----	-----	-----	-----	-----	-----	Abandoned.
-----	-----	-----	-----	-----	-----	Abandoned.
Meyer	May 18, '97	175	Bennette	J. T. Bennette	50	Bledsoe vs. Decrow.
Davidson, Bemis & Lane.	May 18, '97	230	Pioneer	Victor C. Smith	110	Bledsoe vs. Decrow. Combined, 1879.
-----	-----	-----	Downey & Robinson.	Victor C. Smith	-----	Combined. Water used through Pioneer 1916-7.
Decrow & Van Horn.	May 18, '97	400	Decrow	Victor C. Smith	80	Bledsoe vs. Decrow.
Bledsoe & Robinson.	May 18, '97	600	Haws & Robinson.	Victor C. Smith, W. H. Robinson, P. Huerlick.	200	Bledsoe vs. Decrow.
-----	-----	-----	McNew	Carl McNew	50	
-----	-----	-----	Schneidewidt	F. Schneidewidt	25	
-----	-----	-----	Ingraham	W. W. Ingraham	80	
-----	-----	-----	Hartman	Victor C. Smith	80	
-----	-----	-----	Swarthout	George M. Swarthout.	40	Area estimated.
-----	-----	-----	Richardson	—— Richardson	80	
-----	-----	-----	Decrow & Scoble	Decrow, Durell & Scoble.	200	
-----	-----	-----	McLean	McLean	80	Area estimated.
-----	-----	-----	-----	-----	-----	Abandoned.
-----	-----	-----	Stonical	--- Stonical	20	Area estimated.
-----	-----	-----	Harland	R. A. Harland	20	Area estimated.
-----	-----	-----	Daggett	B. A. Funk and T. S. Vandyke.	250	
-----	-----	-----	Yermo	Yermo Mutual Water Co.	200	Water pumped from wells.

On January 27, 1879, also on January 23, 1880, water masters were appointed for these ditches for the seasons. The report of W. H. Robinson, water master on the Pioneer Ditch (No. 1), dated March 5, 1879, is the only one recorded. It shows the water in the ditch to have been apportioned by rotation among seven users, a complete round being made every 15 days and 7 hours.

Of the ditches located in 1879 only one, the Lane & Riley (No. 3), had a filing. Afterwards in 1885 several landowners filed on water to be used through the Pioneer Ditch (No. 1). This ditch and the Foote (No. 4), later the Meyer and now the Bennette, and the Snodderly & Decrow (No. 5) are still in use. The latter two were at first on the west side of the river but were moved to the east side following a change in the river's course in 1884. The Hulday Pearl Ditch (No. 2) which was later abandoned is not to be confused with the A. H. Pearl Ditch which was combined with the Lane & Riley into the Downey & Robinson Ditch of the present time. The Wild Goose (No. 6) was combined with the Pioneer (No. 1) October 24, 1879, the contract signed by the seven water users concerned and recorded providing that the owners of Ditch No. 1 "agree to make Ditch No. 1 as many rods long as Ditch No. 6 now is." A further memorandum is attached to the record of these transactions stating that, "-------- -------- sells his right in Pioneer Ditch (No. 1) to ---------------- for 500 pounds of corn, $5.35 and 25 days work on the ditch." Another agreement dated January 7, 1889, provided that eight users under the Pioneer Ditch give to three landowners a one-fifth interest in the ditch for a right of way through their lands.

The original Houlton Ditch on the West Fork is said to have been abandoned and to have been in a different location from any of the ditches used at a later time for the Burcham Ranch, now Rancho Las Flores. The relation of the present West Fork ditches to the Houlton filing would be affected not so much by a change in location as by any lapse of use for 5 years or more that may have occurred.

From the best evidence available the original Brown Ditch, constructed about 1873, was the lower of the two now on Rancho Verde. The only filing by any of the original or subsequent owners of the Brown Ranch is that of Waters and Brown in 1882, which is believed to have been for the second and Upper Brown Ditch.

The Allison and the Atwood were combined as to water right into the present Driscoll Ditch (Plate V, Fig. 2). The Mill Ditch, used for a time for an ore mill at Oro Grande, was abandoned when the mill ceased to operate and was never used for irrigation. The Hesperia Ditch, now owned by the Appleton Land, Water and Power Company, is the only one diverting water away from the lands in the immediate river bottom.

The early settlers took advantage of the locations where the surface flow of the river is constant and the later appropriators had to depend mainly on flood waters. The ditches now diverting at favorable locations are those that were constructed prior to 1886 and they include the Las Flores No. 1, Las Flores No. 2, Hesperia, Lower Deep Creek, Upper Verde, Lower Verde, Rogers, Driscoll, Bennette, Pioneer, Downey & Robinson, Decrow, Haws and Hartman. The others constructed since 1885 are flood water ditches which receive an adequate supply only during the first part of the irrigating season. Some of these on the lower part of the river receive no water in dry years. The Daggett Ditch diverts the underflow and the Yermo Ditch is supplied by pumping from wells.

The table shows the claims for the ditches to be ridiculously extravagant in amount as was usually the case under the old California law. The filings are of little significance except as they may have protected the appropriators for a reasonable time while initiating construction and carrying it to completion and except as the appropriations may relate back to the filings where the construction was prosecuted diligently. The amounts allotted to ditches by the county water commissioners in 1879 are somewhat more moderate. The rights of the ditches if determined under the present law would be based on beneficial use. No applications to divert water from Mojave River have been received by the State Water Commission since it has had jurisdiction over appropriations under the new law effective January 1, 1914. One filing for a flood water ditch near Barstow was recorded at the county seat in the manner prescribed by the old law, since the new has been in effect.

No complete adjudication of rights on Mojave River has been made and the few priorities and decreed amounts are fixed only as regards certain other ditches or as regards certain users under other ditches involved in the litigation. The Rogers Ditch was decreed a capacity of 800 miner's inches December 24, 1888, by the Superior Court and the judgment was affirmed by the Supreme Court in *Hesperia Land and Water Company* vs. *Rogers* (83 Cal. 11). The amount is extremely liberal in consideration of the area irrigated.

Bledsoe et al. vs. *Decrow et al.* (132 Cal. 312) involved, on the part of the plaintiffs: the Bledsoe, now the Haws and Robinson Ditch, and on the part of the defendants: the Pioneer, the Meyer, formerly the Foote and now the Bennette, and the Snodderly and Decrow ditches. The plaintiffs sought to be adjulged the owners of 600 miner's inches independent of any rights of the defendants, but the Superior Court on

May 18, 1879, found that the defendants had prior rights as against the plaintiffs to divert water at their respective intakes as follows: Meyer, 175 miner's inches; Davidson, Bemis and Lane, users under the Pioneer Ditch, 230 miner's inches; and Deerow and Van Horn, 400 miner's inches. The plaintiff accepted the decree to the defendants Meyer but asked for a new trial as regards the other defendants which was ordered by the court provisional on the parties being unable to agree on certain specified terms different from those of the decree. The defendants appealed from this order and the Supreme Court on March 22, 1901, affirmed the order for a new trial but gave an opinion that the lower court should not state the terms of compromise different from the rights found to belong to the several parties. As there is no further record of this case it appears that there was no second trial or compromise and that the original decision stands. The plaintiffs were decreed the water remaining to the extent of 600 miner's inches as against the defendants after satisfying the prior rights of the defendants but this case considers only a few of the ditches on the river. The rights of both the plaintiffs and the defendants are now to a large extent in one ownership.

At a later time several suits relating to water rights were filed making the Arrowhead Reservoir and Power Company, the Appleton Land, Water and Power Company, Rancho Verde Company and other riparian landowners parties, but no action has been brought on these and by stipulation of the attorneys no action is to be brought by either party unless the other be given ten days' notice.

Most of the appropriation rights for the ditches have been used long enough to become prescriptive. So far as is known the only lack of continuous use in the sense of using water when needed for a part of each year, has been confined to the flood water ditches which can not divert water in seasons of deficient supply.

Nearly all, if not all, of the ditch owners have riparian rights which under the old law had preference over appropriation rights and were not lost by nonuse. Under the present law all water not beneficially used by 1924 will then become subject to appropriation and the preference of the riparian proprietor is reduced to the opportunity to establish his right by using the water on his land before that time.

Owing to uncertain legal definition of riparian land it has not been considered advisable to undertake any exact determination of the extent of such lands. The estimate of the area here given is based on the assumption that the riparian land is limited to the smallest subdivisions that have existed at any time touching the high-water banks of the river and its tributaries and lying within the drainage.

Excepting the lands of the Appleton Land, Water and Power Company, probably few, if any, of the original units exceeded 320 acres, and some were only 160 acres. Some of the original tracts have been subdivided. Therefore it seems sufficient to assume as an average that the riparian land does not extend back from the river more than one-half mile on either side. Considering only irrigable land and land where the flow is regular enough for crops to be matured, an estimate of 20,000 acres of riparian land is given. Adding to this another 20,000 acres for the Appleton company lands, the total estimated area of riparian lands that should be taken account of is about 40,000 acres.

Table No. 14 shows the area of land claimed by the owners to be irrigated under each ditch, the total for all ditches being 3,095 acres of which 2,785 acres are in the river bottom and 310 acres on the mesa at Hesperia. In addition to the 20,000 acres of riparian land owned by the Appleton company other large holdings are estimated not to exceed as follows: Victor C. Smith 5,300 acres, of which 1,500 acres are on Rancho Las Flores, 600 acres are between the Forks and Victorville and 3,200 acres are below Victorville; Rancho Verde Company 1,500 acres; and Arrowhead Reservoir and Power Company 400 acres. The other riparian lands are distributed among numerous owners. The Appleton, Arrowhead and Verde companies control about 27,000 acres of the riparian land.

UNDERGROUND WATERS.

Victor Valley is part of a great alluvial plain sloping northward from the granite mountains of the Sierra Madre Range. The swell of the debris indicates that this portion of the desert was formed in previous geological time by the northward drainage of the San Gabriel Mountains and when much more water flowed in this direction than is now carried by Sheep Creek and the other small streams of the present. Oro Grande and Antelope washes appear to have belonged to this older drainage. In the earlier time, probably that portion of the north slope of the mountains now drained southward by Lytle and Lone Pine creeks was drained northward, the flow being turned southward later by the faulting through Cajon Pass.

The more rounded peaks and more numerous flats of the San Bernardino Mountains in contrast to the sharper outlines and deeper cut canyons resulting from long continued erosion of the San Gabriel Mountains, show the former to have been uplifted in later time than the latter.[1] The great series of faults running diagonally through the range and dividing the two groups of mountains occurred with this movement in relatively recent geological time and formed Cajon Pass.[2] Apparently the elevation of the San Bernardino group produced the drainage of Mojave River which has eroded its channel across the old alluvium separating what was formerly a continuous plain into the east and west mesas.

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[1] United States Geological Survey, Water Supply Paper No. 219, by W. C. Mendenhall.

[2] United States Geological Survey, Bulletin 613.

Mojave River flows through a valley .5 to 2 miles wide and from 100 to 150 feet deep between the east and west mesas as far as the Lower Narrows, and the terrace of the mesa continues on the west side of the channel as far as Hicks.

The east mesa is limited on the north by mountains and buttes and is open to the east only through the constricted pass between Granite Mountain and the San Bernardinos. The west mesa (Plate VI, Fig. 1) is of much broader extent and is only indefinitely bounded on the north by the Shadow Mountains while to the west it continues as the vast plain of Mojave Desert for many miles beyond Victor Valley which may be considered as reaching only to the San Bernardino and Los Angeles County line.

The west mesa slopes from an elevation of 4,000 feet near the foothills to 2,700 feet in a distance of 15 miles out on the plain. The slope is about 100 feet per mile west of Hesperia and it gradually becomes flatter towards the north. The east mesa is in general lower than the west mesa and it has much less slope.

The materials of these mesas, where exposed by the banks of the streams, are shown to have the character of rudely stratified stream detritus. The logs of wells show the same materials to extend throughout the plain. Some of the hills to the north of Victor Valley are of volcanic origin and consist of tuff, rhyolite, and lava.[1]

A survey was made of the wells and pumping plants to determine location, depth to water, and the extent to which pumping can be relied upon for the reclamation of the land. Levels were run to establish the elevation of the water in the wells and for the platting of hydrographic contours from which to make deductions concerning the slope and direction of movement of the underground water. The elevation of the water along lines from east to west is in general above the river on the west side and nearly level with the river on the east side. The slope of the water is less than that of the land, the difference being more marked on the west, than on the east side. In the center of the west mesa it is 15 feet per mile and to the north and northeast. On the east mesa it is to the north but it becomes nearly level over a large area. The ground water east of the river appears to have much more direct connection with the stream than that on the west side. On the east the main source is the river underflow and but minor additions are made to the basin by the foothill drainage to the southeast. The water is held up and forced to return to the stream above the Upper Narrows by the rocky barrier limiting Apple Valley on the north. The West Fork probably contributes to the water in the west mesa and apparently other waters move through the mesa from the foothills west of Cajon Pass in a direction towards Victorville and Oro Grande. The subterranean basin in Mirage Valley no doubt received waters percolating from the region of Sheep Creek. The Shadow Mountains and buttes arrest these waters and divert them eastward or westward from the Mirage dry lake or "Playa" (Plate VI, Fig. 2).

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[1] United States Geological Survey, Bulletin 613.

Numerous springs occur along the west bank of the river from a point 2 miles above, to a point 4.5 miles below, the Upper Narrows. None are found on the east bank. The water seeps from the sandy strata confined between alternating clay strata. The strongest flowing are situated at the Turner ranch below the narrows and about midway between Victorville and Oro Grande. Some of the springs have been developed by tunneling into the sandy layers from which the water outcrops and the flow is used for domestic purposes and for the irrigation of gardens. Those at the Turner ranch fill a small reservoir from which the water is taken to irrigate a field of considerable size. The several groups of springs vary in elevation but 40 feet throughout the 6.5 miles along the river bank and their positions coincide with the water plane of the mesa as shown by the wells. Those upstream and most of those downstream from the Upper Narrows are above the level of the river at that point and those at the Turner ranch, 3.5 miles below Victorville, are but little lower than those near the town while the river falls 67 feet in the same distance. The water in the test well just northwest of the narrows stands 8 feet above the water in the river at the narrows. This seems to show that the seepage water is not from the river immediately above the narrows but, if from the river, rather from some point farther upstream, or from the West Fork, by an indirect route through the mesa. Other observations indicate that the river underflow does not detour around the west side of the rock at the Upper Narrows. The artesian flow from the wells above the narrows is confined to the river bottom and it comes from strata below bedrock in the narrows. The artesian head should not be produced if the passage of the water around the narrows were not obstructed. The same conclusion is reached from the stream flow. The measurements show a loss in the West Fork from the mouth of Horsethief Creek to the Forks, about the same in the main river at the Forks and at the Upper Narrows and a gain from the upper, to the Lower Narrows.

In the event of water being impounded during a part of each season by a dam at the upper narrows, it is probable that the head produced by the stored water would reverse the movement of the seepage and cause water to flow out of instead of into the basin above the west end of the dam. It is also possible that such a reservoir would resist the escape of seepage from the east mesa sufficiently to raise the level of the ground water and lessen the pumping lift for wells on the First Bench and the western portion of Apple Valley.

The ground water on being encountered in drilling has generally risen above the first water bearing stratum in wells piercing more than one such stratum. This artesian action is understood to have been as much as 12 feet in parts of the east mesa and as much as 20 feet in parts of the west mesa but it has not been sufficient to cause any wells outside the river bottom to flow. The water level is approximately shown by the hydrographic contours and the depth to water is represented by the difference between the topographic and hydrographic contours on the map. Theoretically the water level is above the ground surface in the artesian area.

Comparison of the elevations of the water level in 1917 with the elevation when the wells were completed in cases where the records are available from well owners and drillers shows that the water level has receded throughout Victor Valley, in most wells not to exceed 10 feet. The drop may, in part at least, be attributed to recent dry years occurring in the declining portion of the supposed cycle of precipitation. Observations have not covered a period of long enough duration to determine whether or not pumping is depleting the underground basins in excess of the average annual contribution to them. The well waters are of good quality for irrigation.

Fig. 3 shows diagrams of the logs of some of the typical deeper wells in the different parts of Victor Valley.

WELLS AND PUMPING.

The data obtained on wells is tabulated as an appendix to this report. The information on wells 302 to 333 was furnished by the United States Geological Survey. The numbering of the wells in the table corresponds to the numbering on the accompanying map. In some cases it was not practicable to obtain all of the data to make the table complete and only such information as seems to be reasonably reliable has been included. Some of the wells are owned by nonresidents who could not be reached. The depth to water was measured wherever practicable. In other cases the statement of the owner or driller was taken. The date of measurement is given only for the wells in which depth to water was measured for this investigation. The elevations of ground and water are those determined for the mapping of the hydrographic contours. In the column showing kind of pumps the terms "single deep well" and "double deep well" refer to the single and double acting plunger

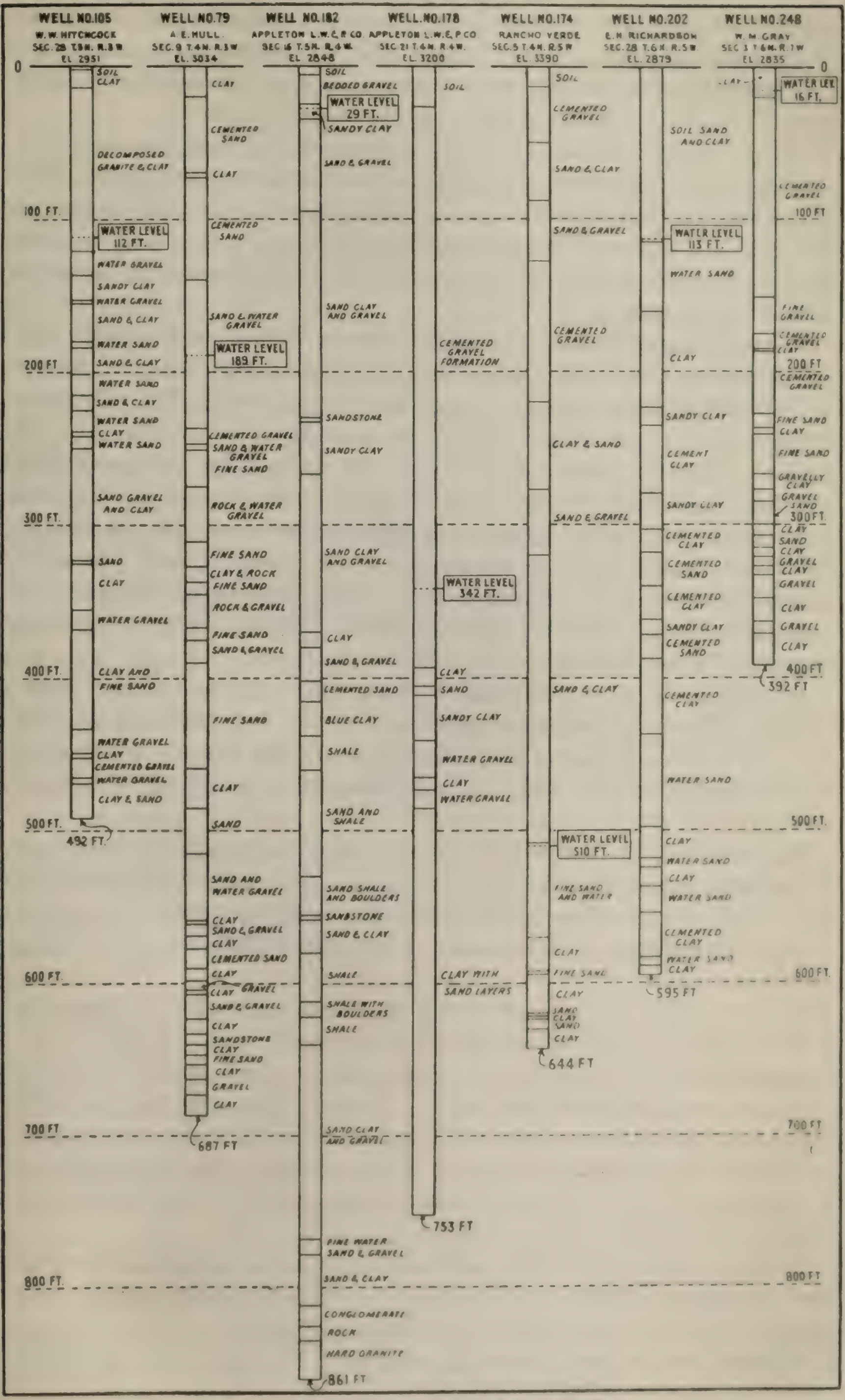

Fig. 3.—Diagrams of wells in Victor Valley.

pumps of large size developed in southern California for irrigating plants with high lifts. These pumps have become known commercially as here designated and they are distinguished from the smaller cylinder pumps used with windmills and domestic water plants.

In few cases only were the plants in operation and the discharge measured on being visited. Most of the discharges are those claimed by the owners or their representatives. Many have never been measured and they are probably overestimated. The miner's inch here used is equal to one-fiftieth part of a second-foot. Other columns in the table require no explanation.

The total number of wells between the mountains on the south and the north line of township 6 on the north and between Lucerne Valley on the east and Los Angeles County line on the west is 333. Of these 214 are drilled and steel-cased and the remainder are dug-shafts. A total of 125 wells, the most of which are drilled, are equipped with pumping machinery, the power being gasoline or oil engines with but four exceptions, and 43 wells are pumped with windmills. Although the main transmission line of the Southern Sierras Power Company crosses Victor Valley, electric power is not distributed generally to pumping plants. Thirteen wells, all located in the river bottom just above the Upper Narrows on Rancho Verde, flow.

An abundance of ground water and low lifts make pumping economical and efficient in the river bottom and on the first bench of the east mesa. This area embraces 48 pumping plants, the most of which have lifts ranging from 50 to 100 feet and discharges from 50 to 200 miner's inches.

The second or main bench of the east mesa, including the pass east of Deadman Point, has 31 pumping plants. The highest discharge for any of these is 70 miner's inches and the most are under 50 miner's inches. Excluding the plants in the pass the lifts range from 72 to 242 feet.

The west mesa includes 40 pumping plants. The lift at Hesperia is 300 feet and at one well on Baldy Mesa it is 869 feet. Such lifts are economically prohibitive for this region and but small streams of water have been pumped from these wells. The lifts are lower and the wells better near the settlement of Adelanto in Sunrise Valley and still better conditions for pumping are found in Mirage Valley. The depth to water is only about 20 feet in wells near the dry lake bed and some good producing wells are located there.

Excluding the river bottom and first bench and considering the mesa lands, it appears that the only sections in which pumping underground water can be relied upon as the sole source of supply to irrigate large solid areas are the north central portion of the east mesa, the lower portion of Mirage Valley and possibly that in the vicinity of Adelanto. A great majority of the west mesa and a portion of the east mesa can be reclaimed only by stream flood waters, stored and conveyed by gravity.

About one-half million dollars has been invested in wells and pumping machinery in Victor Valley. In addition to the plants within the territory of the map, numerous others are pumping from wells along the lower part of the river the most being near Hicks, Barstow, Daggett and Minneola. The plain about Hinckley, 6 miles northwest of the river. between Hicks and Barstow and where the underground water is no doubt in part from the river, is also the scene of pumping activity.

Included herewith are estimates of the cost of pumping intended to represent three sets of conditions found in Victor Valley. Case No. 1 is for the river bottom where the wells are comparatively shallow and good producers, the pumping lifts low, the soil sandy, the crop alfalfa, and the amount of water required high. Case No. 2 is typical of orchard irrigation in portions of Apple Valley. Here the wells are deeper, the lifts greater, the discharges less, the soil tighter and the duty of water higher. This case would apply also to a limited portion of Mirage Valley. Case No. 3 is suggested by conditions of the west mesa, particularly those of the central portion. Here the water must be used for orchards, sparingly on account of the small streams produced by the wells and the expense of pumping against high heads. Case No. 4 is a duplicate of No. 3 except that an electric motor is substituted for the engine to compare the cost of the two modes of power.

Depreciation is not counted on well and building. The percentages are selected for the several combinations of types of pumps and motive power, considering the deep well pump more durable than the centrifugal or the turbine, and the electric motor more durable than the gasoline or semi-Diesel engine. The plant efficiency is also a combination of that for the power and the pump and in fixing the percentages, preference is given slightly to motors over engines and more decidedly to deep well pumps over the types with speedily moving parts. Although deep well pumps have higher mechanical efficiency and longer life than centrifugals and turbines they generally require more expense for repairs under which is included the cost of renewing plunger leathers and the pulling of the rods. The costs of machinery on which computations of fixed charges are based are slightly less than those of the present time (1917) and they approximate the prices that obtained in 1915 which year is believed to better represent the normal.

Case No. 1.

Crop to be irrigated, alfalfa.

Depth of water on land required, 5 ft. Amount of water furnished by well, 150 mi. in. (3 sec. ft.). Season, 150 days (3,600 hrs.).

Area plant will irrigate 180 acres. Lift, 50 ft. Work done, 17 h. p.

Power required at 40 per cent efficiency, 43 h. p.

Cost of plant:

Well, 200 ft. deep, drilling at $2.00 per ft.	$400 00	
Casing, 12 in., double stove pipe, 12 gage, 180 ft. at $2.25 per ft.	405 00	
Starter, 20 ft., 3 ply, and ring	80 00	
Pit, 6 ft. x 6 ft. x 40 ft., redwood curbing at $2.00 per ft.	80 00	
		$965 00
Pump, 7 in., single stage, vertical, centrifugal, wooden frame, shafting pipe, pulley, installed complete		1,250 00
Engine, oil, 50 h. p. freight, concrete foundation, installed complete		1,850 00
Belt, 64 ft.		85 00
Building, 10 ft. x 48 ft. and derrick		500 00
Total		$4,650 00

Cost of plant per mi. in., $31.00.

Cost of plant per acre, $25.83.

Cost of operation:

Interest, $4,650.00 at 6 per cent	$279 00	
Taxes and insurance, $4,650 at 1 per cent	46 00	
Depreciation on machinery, $3,185 at 12 per cent	382 20	
		$707 70
Fuel, 40 degree (Baumé) oil, 43 h. p., 3,600 hrs., ⅛ gal. per h. p. hr., 19,350 gal. at $.07 per gal. delivered		1,354 50
Attendance, 150 days at $2.00 per day		300 00
Repairs, lubricating oil, etc.		50 00
Total		$2,412 20

Amount of water pumped, 150 mi. in. for 3,600 hrs., 900 acre ft.

Cost of water per acre ft., $2,68.

Cost of water per mi. in. per hr., $.0045.

Cost of water per acre per annum, $13.40.

Case No. 2.

Crop to be irrigated, apples.

Depth of water on land 1.5 ft. Amount of water furnished by well, 50 mi. in. (1 sec. ft.). Season, 150 days (3600 hrs.).

Area plant will irrigate 200 acres. Lift, 100 ft. Work done, 11.4 h. p.

Power required at 35 per cent efficiency, 32.5.

Cost of plant:

Well, 400 ft. deep, drilling at $2.00 per ft.	$800 00	
Casing, 12 in. double stove pipe, 12 gage, 380 ft. at $2.25 per ft.	855 00	
Starter, 20 ft., 3 ply, and ring	90 00	
		$1,745 00
Pump, 9½ in., 8 stage, turbine, installed complete		2,150 00
Engine, oil, 35 h. p., freight, concrete foundation, installed complete		1,400 00
Belt, 60 ft.		70 00
Building 10 ft. x 48 ft. and derrick		500 00
Total		$5,865 00

Cost of plant per mi. in., $117.30.

Cost of plant per acre, $29.32.

Cost of operation:

Interest, $5,865 at 6 per cent	$351 90	
Taxes and insurance, $5,865 at 1 per cent	58 65	
Depreciation on machinery, $3,620 at 13 per cent	470 60	
		$881 15
Fuel, 40 degree (Baumé) oil, 32.5 h. p., 3,600 hrs., ⅛ gal. per h. p. hr., 14,625 gal. at $.07 per gal. delivered		1,023 75
Attendance, 150 days at $2.00 per day		300 00
Repairs, lubricating oil, etc.		50 00
Total		$2,254 90

Amount of water pumped, 50 mi. in. for 3,600 hrs., 300 acre ft.

Cost of water per acre ft., $7.52.

Cost of water per mi. in. per hr., $.0125.

Cost of water per acre per annum, $11.27.

Case No. 3.

Crop to be irrigated, apples.

Depth of water on land, 1.25 ft. Amount of water furnished by well, 25 mi. in. (.5 sec. ft.). Season, 150 days (3,600 hrs.)

Area plant will irrigate 120 acres. Lift, 250 ft. Work done, 14.2 h. p.

Power required at 50 per cent efficiency, 28.4 h. p.

Cost of plant:

Well, 500 ft. deep, drilling at $2.00 per ft.	$1,000 00	
Casing, 12 in., double stove pipe, 12 gage, 480 ft. at $2.25 per ft.	1,080 00	
Starter, 20 ft., 3 ply, and ring	90 00	
		$2,170 00
Pump, double acting, deep well, plunger, 20 h. p. 8 in. cyl., 56 in. double stroke, 20 strokes per min., concrete foundation, derrick and hoist, installed complete		2,400 00
Engine, oil, 30 h. p., concrete foundation, installed complete, including freight		1,250 00
Belt, 60 ft.		50 00
Building, 10 ft. x 48 ft.		400 00
Total		$6,270 00

Cost of plant per mi. in., $250.80.

Cost of plant per acre, $52.25.

Cost of operation:

Interest, $6,270 at 6 per cent	$376 20	
Taxes and insurance, $6,270 at 1 per cent	62 70	
Depreciation on machinery, $3,700 at 10 per cent	370 00	
		$808 90
Fuel, 40 degree (Baumé) oil, 28.4 h. p., 3,600 hrs., ⅛ gal. per h. p. hr., 12,780 gal. at $.07 per gal. delivered		894 60
Attendance, 150 days at $1.50 per day		225 00
Repairs, lubricating oil, etc.		100 00
Total		$2,028 50

Amount of water pumped, 25 mi. in. for 3,600 hrs., 150 acre feet.

Cost of water per acre foot, $13.52.

Cost of water per mi. in. per hr., $.0225.

Cost of water per acre per annum, $16.90.

Case No. 4.

Crop to be irrigated, apples.

Depth of water on land 1.25 ft. Amount of water furnished by well, 25 mi. in. (.5 sec. ft.). Season, 150 days (3,600 hrs.).

Area plant will irrigate, 120 acres. Lift, 250 ft. Work done, 14.2 h. p.

Power required at 55 per cent efficiency, 25.8 h. p.

Cost of plant:

Well, 500 ft. deep, drilling at $2.00 per ft.	$1,000 00	
Casing, 12 in., double stove pipe, 12 gage, 480 ft. at $2.25 per ft.	1,080 00	
Starter, 20 ft., 3 ply, and ring	90 00	
		$2,170 00
Pump, double acting, deep well, plunger, 20 h. p., 8 in. cyl., 56 in. double stroke, 20 strokes per min., concrete foundation, derrick and hoist, installed complete		2,400 00
Motor, 30 h. p., induction, 550 volt, 60 cycle, 3 phase, 1,800 r. p. m., concrete foundation, installed complete, including freight		520 00
Belt, 60 ft.		50 00
Building, 10 ft. x 48 ft.		400 00
Total		$5,540 00

Cost of plant per mi. in., $221.60.

Cost of plant per acre, $46.18.

Cost of operation:

Interest, $5,540 at 6 per cent	$332 40	
Taxes and insurance, $5,540 at 1 per cent	55 40	
Depreciation on machinery, $2,970 at 8 per cent	237 60	
		$625 40
Electrical power 19.25 k.w. (25.8 h.p.) 3,600 hrs., 69,300 k.w. hrs., at $.0175 per k.w. hr.		1,212 75
Attendance, 150 days at $1.00 per day		150 00
Repairs and lubricating oil		75 00
Total		$2,063 15

Amount of water pumped, 25 mi. in. for 3,600 hrs., 150 acre ft.

Cost of water per acre ft., $13.74.

Cost of water per mi. in. per hr., $.0229.

Cost of water per acre per annum, $17.19.

For orchard irrigation, especially with expensive water as under cases No. 3 and No. 4, it would be economical and desirable to use concrete pipe underground to convey and distribute the water to the furrows and trees. Such a system for a 10 acre tract is estimated to cost as follows:

630 ft. of 8 in. concrete pipe at $.18 per ft. laid	$113 40
21 stands, 30 ft. apart, with iron valves at $2.00 each	42 00
1 gate basin with iron slide gate	8 00
	$163 40

Cost per acre, $16.34.

STREAM DISCHARGE.

The mountain watershed of Mojave River has an area of 217 square miles of which 142 square miles are drained by Deep Creek or the East Fork and 75 square miles are drained by the West Fork. The watershed varies from an elevation of 8,000 feet at its highest point to 3,000 feet at the Forks where the entire drainage is brought together in the main river. The northern slopes (Plate III, Fig. 1) of the Sierra Madre Range receive less precipitation than the southern slopes but they are less steep, less subject to direct rays of the sun, better timbered and they hold the snows longer and have slower runoff in proportion to precipitation than southern slopes.

The comprehensive metereological observations made throughout the watershed by the Arrowhead Reservoir and Power Company for over 20 years show the precipitation to vary from about 15 inches at the Forks to about 50 inches near the summit, the maximum occurring in the flats situated just north of the crest of the range, and flanked by peaks. The precipitation falls off rapidly towards the desert on the northeast. The more elevated portions of the watershed are in heavy timber of pine and fir without much undergrowth and the lower portions are covered with thick brush. Table No. 14 shows the areas drained by the branches grouped according to the reservoir sites into which they are tributary. The drainage of Deep Creek below the upper storage works can be made tributary to the Forks site by diversion.

TABLE No. 15.

Mountain Drainage Areas of Mojave River.

	Square miles	Square miles	Square miles
Deep Creek (East Fork).			
Above Little Bear Valley reservoir and tunnel—			
Little Bear Creek	6.64		
Hooks, Fern, Shake, Cedar and Sheep creeks	3.61		
Deep Creek	16.10		
Crab Creek	3.70		
Holbrook Creek and tributaries	33.76		
Cox Creek	9.39		
Grass Valley Creek[1]	2.72		
Total, Little Bear Valley reservoir		75.92	
Below Little Bear Valley reservoir and tunnel		65.88	
Total, Deep Creek			141.80
West Fork.			
Above dam site No. 2—			
East Fork of West Fork	18.82		
West Fork of West Fork	11.05		
Between dam sites Nos. 2 and 3	4.95		
Total, reservoir sites No. 2 and No. 3		34.82	
Below dam site No. 2 and Grass Valley dam site		39.96	
Total, West Fork (Forks reservoir site)			74.78
Total, Mojave River			216.58

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[1] Naturally tributary to West Fork.

An examination of the precipitation records for southern California suggests the selection of a period of about 17 years as a proper one on which to base the average runoff. Tables No. 16 to No. 20 show the precipitation at several stations; the first for 65 seasons at San Diego, the longest record in southern California; the next for 45 seasons at San Bernardino, the second longest record, and the others for Glen Ranch, Bear Valley Dam and Gate House, the latter being at Little Bear Valley Dam, and the only one in the Mojave River watershed. The table for San Diego shows the average for periods of different lengths terminating with 1914-15, also the ratios of these averages to the average for the longest period. It is noticed that 17 seasons must be included to obtain a period terminating with 1914-15 to give an average equal to the average for the longest period.

The tables for the other stations show the ratios of averages for the different periods to the average for the longest period equated to the longer 65 season record at San Diego. The average for the last 17 seasons at the several stations agree remarkably well and it seems that this represents a cycle from which safe deductions of runoff can be made. However, from a study of the precipitation records of this immediate late period and from common knowledge of several seasons of low flood discharges about this time, it seems advisable, in order to consider the most unfavorable conditions which may arise, to extend the period back one additional season to include the low seasonal discharge for 1897-98, making the period 18 seasons.

TABLE No. 16.

Precipitation at San Diego.

Elevation, 93 feet.

Season	Precipitation, inches	Period	Average precipitation for period, inches	Ratio to 65 season average, per cent	Number of seasons in period
1850–51	8.41	1850–1915	9.70	100.00	65
1851–52	9.48	1851–1915	9.72	100.21	64
1852–53	11.03	1852–1915	9.72	100.21	63
1853–54	9.77	1853–1915	9.70	100.00	62
1854–55	13.56	1854–1915	9.70	100.00	61
1855–56	9.89	1855–1915	9.64	99.37	60
1856–57	4.76	1856–1915	9.63	99.27	59
1857–58	7.54	1857–1915	9.72	100.21	58
1858–59	6.61	1858–1915	9.76	100.62	57
1859–60	6.58	1859–1915	9.81	101.13	56
1860–61	7.90	1860–1915	9.87	101.75	55
1861–62	15.64	1861–1915	9.90	102.06	54
1862–63	3.87	1862–1915	9.80	101.03	53
1863–64	5.14	1863–1915	9.91	102.16	52
1864–65	8.45	1864–1915	10.00	103.09	51
1865–66	12.82	1865–1915	10.04	103.51	50
1866–67	13.73	1866–1915	9.98	102.89	49

TABLE No. 16—Continued.

Precipitation at San Diego.

Season	Precipitation, inches	Period	Average precipitation for period, inches	Ratio to 65 season average, per cent	Number of seasons in period
1867–68	11.23	1867–1915	9.90	102.06	48
1868–69	11.68	1868–1915	9.87	101.75	47
1869–70	5.48	1869–1915	9.83	101.34	46
1870–71	5.17	1870–1915	9.93	102.37	45
1871–72	7.18	1871–1915	10.04	103.51	44
1872–73	6.50	1872–1915	10.11	104.23	43
1873–74	16.88	1873–1915	10.19	105.05	42
1874–75	5.73	1874–1915	10.02	103.30	41
1875–76	10.11	1875–1915	10.14	104.54	40
1876–77	3.75	1876–1915	10.13	104.43	39
1877–78	16.10	1877–1915	10.30	106.18	38
1878–79	7.88	1878–1915	10.15	104.64	37
1879–80	14.36	1879–1915	10.21	105.25	36
1880–81	9.66	1880–1915	10.09	104.02	35
1881–82	9.51	1881–1915	10.11	104.22	34
1882–83	4.92	1882–1915	10.12	104.33	33
1883–84	25.97	1883–1915	10.29	106.08	32
1884–85	8.67	1884–1915	9.78	100.82	31
1885–86	16.96	1885–1915	9.82	101.24	30
1886–87	8.32	1886–1915	9.57	98.66	29
1887–88	9.82	1887–1915	9.62	99.17	28
1888–89	11.02	1888–1915	9.61	99.07	27
1889–90	15.02	1889–1915	9.55	98.45	26
1890–91	10.47	1890–1915	9.33	96.18	25
1891–92	8.70	1891–1915	9.29	95.77	24
1892–93	9.26	1892–1915	9.31	95.88	23
1893–94	4.97	1893–1915	9.32	96.08	22
1894–95	11.90	1894–1915	9.52	98.14	21
1895–96	6.21	1895–1915	9.40	96.91	20
1896–97	11.78	1896–1915	9.57	98.66	19
1897–98	4.99	1897–1915	9.45	97.42	18
1898–99	5.24	1898–1915	9.71	100.10	17
1899–00	5.97	1899–1915	9.99	102.99	16
1900–01	10.45	1900–1915	10.26	105.77	15
1901–02	6.17	1901–1915	10.24	105.57	14
1902–03	11.76	1902–1915	10.56	108.87	13
1903–04	4.40	1903–1915	10.46	107.83	12
1904–05	14.32	1904–1915	11.01	113.50	11
1905–06	14.68	1905–1915	10.68	110.10	10
1906–07	10.62	1906–1915	10.23	105.46	9
1907–08	8.55	1907–1915	10.19	105.05	8
1908–09	10.23	1908–1915	10.42	107.42	7
1909–10	9.79	1909–1915	10.45	107.73	6
1910–11	11.99	1910–1915	10.58	109.07	5
1911–12	10.72	1911–1915	10.23	105.46	4
1912–13	5.97	1912–1915	10.07	103.81	3
1913–14	9.83	1913–1915	12.12	124.95	2
1914–15	11.41	1914–1915	14.41	148.55	1

TABLE No. 17.

Precipitation at San Bernardino.

Elevation, 1,054 feet.

Season	Precipitation, inches	Period	Average precipitation for period, inches	Ratio to 45 season average, per cent	Ratio to equated 65 season average, per cent	Number of seasons in period
1870-71	13.94	1870-1915	16.01	100.00	102.37	45
1871-72	8.98	1871-1915	16.05	100.25	102.62	44
1872-73	15.10—	1872-1915	16.22	101.31	103.71	43
1873-74	23.81	1873-1915	16.24	101.43	103.84	42
1874-75	13.65	1874-1915	16.06	100.31	102.69	41
1875-76	19.90	1875-1915	16.12	100.69	103.07	40
1876-77	9.52	1876-1915	16.02	100.06	102.43	39
1877-78	20.33	1877-1915	16.19	101.12	103.52	38
1878-79	11.54	1878-1915	16.08	100.43	102.82	37
1879-80	20.36	1879-1915	16.21	101.24	103.64	36
1880-81	13.50	1880-1915	16.09	100.50	102.88	35
1881-82	11.54	1881-1915	16.17	100.99	103.39	34
1882-83	9.17	1882-1915	16.31	101.87	102.60	33
1883-84	37.51	1883-1915	16.53	103.25	105.69	32
1884-85	10.81	1884-1915	15.85	99.00	101.34	31
1885-86	21.93	1885-1915	16.02	100.06	102.63	30
1886-87	14.50	1886-1915	15.82	98.81	101.15	29
1887-88	17.76	1887-1915	15.86	99.06	101.41	28
1888-89	20.97	1888-1915	15.79	98.62	100.96	27
1889-90	25.45	1889-1915	15.68	97.94	100.02	26
1890-91	18.08	1890-1915	15.20	94.94	97.19	25
1891-92	14.35	1891-1915	15.08	94.19	96.42	24
1892-93	19.82	1892-1915	15.11	94.37	96.61	23
1893-94	8.13	1893-1915	14.90	93.06	95.27	22
1894-95	20.98	1894-1915	15.22	95.06	97.32	21
1895-96	8.11	1895-1915	14.94	93.31	95.52	20
1896-97	16.74	1896-1915	15.29	95.50	97.76	19
1897-98	8.24	1897-1915	15.21	95.03	97.25	18
1898-99	7.49	1898-1915	15.62	97.56	99.87	17
1899-00	8.64	1899-1915	16.13	100.74	103.13	16
1900-01	17.36	1900-1915	16.63	103.87	106.33	15
1901-02	11.15	1901-1915	16.58	103.56	106.01	14
1902-03	17.42	1902-1915	16.99	106.12	108.63	13
1903-04	9.37	1903-1915	16.96	105.93	108.44	12
1904-05	20.78	1904-1915	17.65	110.24	112.85	11
1905-06	19.88	1905-1915	17.34	108.31	110.87	10
1906-07	23.17	1906-1915	17.06	106.56	109.08	9
1907-08	15.62	1907-1915	16.29	101.12	104.16	8
1908-09	17.36	1908-1915	16.39	102.37	104.80	7
1909-10	15.02	1909-1915	16.23	101.37	103.77	6
1910-11	16.34	1910-1915	16.47	102.87	103.06	5
1911-12	13.84	1911-1915	16.50	103.06	105.50	4
1912-13	11.08	1912-1915	17.39	108.62	111.19	3
1913-14	21.45	1913-1915	20.55	128.36	131.39	2
1914-15	19.64	1914-1915	19.64	122.67	125.58	1

TABLE No. 18.

Precipitation at Glen Ranch, San Bernardino Mountains.

Elevation, 3,256 feet.

Season	Precipitation, inches	Period	Average precipitation for period, inches	Ratio to 15 season average, per cent	Ratio to equated 65 season average, per cent	Number of seasons in period
1900-01	29.27	1900-1915	33.76	100.00	106.33	15
1901-02	15.00	1901-1915	34.08	100.94	107.33	14
1902-03	29.75	1902-1915	35.55	105.30	111.97	13
1903-04	18.53	1903-1915	36.04	106.75	113.51	12
1904-05	38.41	1904-1915	37.63	111.46	118.51	11
1905-06	37.63	1905-1915	37.55	111.22	118.26	10
1906-07	49.69	1906-1915	37.54	111.19	118.23	9
1907-08	25.95	1907-1915	36.02	106.69	113.44	8
1908-09	33.88	1908-1915	37.46	110.96	117.98	7
1909-10	34.67	1909-1915	38.06	112.73	119.87	6
1910-11	45.86	1910-1915	38.75	114.78	122.05	5
1911-12	36.45	1911-1915	36.95	109.44	116.37	4
1912-13	20.13	1912-1915	37.12	109.95	116.91	3
1913-14	53.61	1913-1915	45.62	135.13	143.68	2
1914-15	37.63	1914-1915	37.63	111.46	118.51	1

TABLE No. 19.

Precipitation at Bear Valley Dam.

Elevation, 6,500 feet.

Season	Precipitation, inches	Period	Average precipitation for period, inches	Ratio to 23 season average, per cent	Ratio to equated 65 season average, per cent	Number of seasons in period
1892-93	44.31	1892-1915	34.37	100.00	96.35	23
1893-94	24.86	1893-1915	33.92	98.69	95.09	22
1894-95	50.29	1894-1915	34.35	99.94	96.30	21
1895-96	11.29	1895-1915	33.56	97.64	94.83	20
1896-97	33.25	1896-1915	34.73	101.04	97.35	19
1897-98	20.22	1897-1915	34.81	101.28	97.59	18
1898-99	13.93	1898-1915	35.67	103.78	100.00	17
1899-00	20.47	1899-1915	37.03	107.74	103.81	16
1900-01	31.52	1900-1915	38.13	110.93	106.88	15
1901-02	26.68	1901-1915	38.61	112.33	108.23	14
1902-03	40.42	1902-1915	39.52	114.98	110.79	13
1903-04	25.15	1903-1915	39.45	114.78	110.60	12
1904-05	44.36	1904-1915	40.75	118.56	114.24	11
1905-06	48.25	1905-1915	40.39	117.51	113.23	10
1906-07	48.38	1906-1915	39.51	114.95	110.26	9
1907-08	30.12	1907-1915	38.41	111.75	107.68	8
1908-09	38.20	1908-1915	39.59	115.18	110.84	7
1909-10	34.15	1909-1915	39.82	115.85	111.63	6
1910-11	49.21	1910-1915	40.96	119.17	114.83	5
1911-12	25.60	1911-1915	38.89	113.15	109.02	4
1912-13	22.00	1912-1915	43.32	126.04	121.45	3
1913-14	53.05	1913-1915	53.90	156.82	151.11	2
1914-15	54.93	1914-1915	54.93	159.82	154.00	1

TABLE No. 20.

Precipitation at Gate House, Little Bear Valley.

Elevation. 5,200 feet.

Season	Precipitation, inches	Period	Average precipitation for period, inches	Ratio to 22 season average, per cent	Ratio to equated 65 season average, per cent	Number of seasons in period
1893–94	23.60	1893–1915	31.36	100.00	96.79	22
1894–95	48.66	1894–1915	31.73	101.18	97.93	21
1895–96	13.84	1895–1915	30.88	98.46	95.30	20
1896–97	33.65	1896–1915	31.78	101.34	98.09	19
1897–98	19.40	1897–1915	31.68	101.02	97.78	18
1898–99	13.66	1898–1915	32.40	103.31	100.00	17
1899–00	22.77	1899–1915	33.57	102.05	98.78	16
1900–01	36.73	1900–1915	34.09	108.71	105.22	15
1901–02	20.70	1901–1915	34.12	108.80	105.31	14
1902–03	30.13	1902–1915	35.15	112.08	108.48	13
1903–04	24.32	1903–1915	35.57	113.42	109.78	12
1904–05	36.68	1904–1915	36.59	116.68	112.94	11
1905–06	42.95	1905–1915	36.59	116.68	112.94	10
1906–07	57.48	1906–1915	35.88	114.41	110.74	9
1907–08	26.29	1907–1915	33.18	105.80	102.41	8
1908–09	40.66	1908–1915	34.16	109.28	105.77	7
1909–10	33.23	1909–1915	33.06	105.42	102.04	6
1910–11	44.63	1910–1915	33.05	105.38	102.00	5
1911–12	23.18	1911–1915	30.16	96.17	93.08	4
1912–13	21.99	1912–1915	32.48	103.57	100.25	3
1913–14	43.88	1913–1915	37.73	120.31	116.46	2
1914–15	31.59	1914–1915	31.59	100.73	97.50	1

Several sets of measurements have been used to determine the mean annual discharge of Mojave River in the preparation of this report. The Arrowhead Reservoir and Power Company measured the streams in the upper watershed now tributary or to be tributary to Little Bear Valley reservoir beginning with 1891-2, except the seasons 1900-1 to 1903-4, inclusive, also the East and West Forks at the Forks (Plate II, Fig. 2) and the main river at the Lower Narrows (Plate V, Fig. 2) continuously beginning with 1905-6. The United States Geological Survey maintained a gaging station on the river at the Upper Narrows (Plate V, Fig. 1) 1899-1900 to 1905-6, inclusive, and the Mojave Water and Power Company continued the measurements to and including 1913-14, also measured the East and West Forks at the Forks 1906-7 to 1913-14, inclusive. Thus both the Arrowhead and Mojave companies gaged the flow at the Forks from 1908-9 to 1913-14, inclusive, so that these measurements, being for the same seasons at the same point are directly comparable. The several measurements were compared and correlated in the following manner: All apparent conflicts between the several series were subjected to detailed study, the computations being checked from the original daily records. It was found that the only material differences occurred in the records of the heavier winter floods. In one instance of considerable conflict, the Forks records for 1911-12, regarding which no other method of weighing the value of the records suggested itself, recourse was had to the precipitation record which definitely indicated that preference should be given the Arrowhead company's measurement.

In general, the precipitation records were not of as much value in checking the discharge as the comparison of the discharge measurements themselves. A study of the precipitation is, however, not without interest. In only two seasons were any errors of consequence found in the Forks measurements of the Arrowhead company. Both appeared to have occurred in plotting the larger flood records and to be due to infrequency of measurements, probably caused by the difficulty of obtaining them during the period of excessive flow. In only one instance was the error of enough magnitude to affect appreciably the average for a period of years. This was for the heavy flood of 1909-10 where the measurement of Deep Creek was 130,000 acre-feet while that of the Mojave Water and Power Company was 76,000 acre-feet. Fortunately measurements were made at both the Upper and Lower Narrows for this season. By plotting these with allowance for the difference in time of the peak of the flood at the different points and with an interpolation of the curve of the declining flood as obtained from the more frequent measurements at the Narrows during the same time a corrected curve was obtained for the Forks which reduced the Arrowhead company's measurement about 31,000, but still left a difference of about 23,000 acre-feet between the measurement of this company and that of the Mojave company. As these could not be further reconciled an average of them was taken. The same method was applied for the seasons 1908-9 to 1913-14, inclusive, during which the two measurements were made at the Forks. The Arrowhead company made the only measurements at the Forks for 1906-7 and 1907-8. The records agree so well with those of the Mojave company at the Upper Narrows that they are assumed to be correct.

A marked discrepancy occurs for the season 1905-6 between the measurements of the Arrowhead company at the Forks and those of the Geological Survey at the Upper Narrows as shown by Table No. 21. The published government records[1] are incomplete for the latter part of the season and the data were supplied by the Mojave Water and Power Company.

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[1] United States Geological Survey, Water Supply Paper No. 300.

TABLE No. 21.

Discharge of Mojave River at Forks and Upper and Lower Narrows—1905-1906.

Month	Discharge at Forks (A. R. & P. Co.) Acre feet	Discharge at Upper Narrows (U. S. G. S.) Acre feet	Discharge at Lower Narrows (A. R. & P. Co.) Acre feet
July	449	1,986	1,318
August	82	1,943	1,602
September	43	2,380	1,659
October	102	2,859	2,383
November	360	3,808	2,761
December	659	4,120	2,841
January	3,703	4,205	2,888
February	4,376	3,637	2,493
March	84,406	126,153	56,790
April	21,771	23,766	17,753
May	12,994	6,800	8,357
June	6,305	3,909	3,135
Season	135,220	185,596	103,970

The Forks measurement for this season is approximately 135,000 acre-feet while that at the Upper Narrows is approximately 185,000 acre-feet. This increase is too large to be explained as inflow from the underground basin above the Narrows or as local runoff from the valley below the Forks. The flow at the Lower Narrows for this season was measured by the Arrowhead company to be approximately 104,000 acre-feet. The records for this season at the three points of measurement show reasonable agreement except for the month of March. The records for this month at the Forks and Lower Narrows are within the limits of what might be expected as difference between these points. The flow recorded for the Upper Narrows is manifestly incorrect if the other records are relied upon. It was therefore decided to regard the Forks record as being correct.

Disregarding 1905-6, and taking the average for 1906-7 to 1913-14, inclusive, as shown by Table No. 22, the average for these 7 years at the Forks varies less than 2 per cent from the average for the same period at the Upper Narrows.

TABLE No. 22.

Discharge of Mojave River at Forks and Upper Narrows.

Season	East Fork at Forks (Acre feet)	West Fork at Forks (Acre feet)	Mojave River at Forks (Acre feet)	Mojave River at Upper Narrows (Acre feet)	Per cent of discharge at Forks to discharge at Upper Narrows
1905–06	87,633	47,587	135,220	185,596	73.2
1906–07	136,052	118,265	254,317	259,906	98.2
1907–08	40.920	19,856	60,776	56,057	108.1
1908–09	54,257	35,483	89,740	97,781	91.8
1909–10	87,656	48,049	135,705	118,084	114.8
1910–11	86,627	61.311	147,938	135,903	108.9
1911–12	29,037	17,927	46,964	50,519	93.2
1912–13	14,900	11,460	26,360	35,297	74.6
1913–14	105,130	64,805	------------	------------	------------
1914–15	77,331	45,305	------------	------------	------------

In general, there is a loss from the Forks to the Upper Narrows in years of heavy flood and a gain in years of relatively small flood. This may be explained on the theory that water in this part of the river is lost from the surface flow to the underflow in the heavy floods and returned by the charged gravels to the surface stream above the Narrows in seasons of light discharge. It appears from the measurements that practically all of the water which enters the underground basin below the Forks is re-collected above the Narrows and flows out through them. The observations on underground water serve to confirm this belief.

The close relation shown to exist between the flow at the Forks and that at the Upper Narrows suggests an interpolation of discharge for 1899-1900 to 1904-5, inclusive, during which period no gagings were made at the Forks. Table No. 22 shows the relation between the discharge at the Forks and that at the Upper Narrows from 1905-6 to 1912-13, inclusive.

From these percentages and from the recorded discharges at the Upper Narrows from 1899-1900 to 1904-5, inclusive, the probable percentage of discharge at the Forks to that at the Upper Narrows for each season was obtained and used to compute discharges at the Forks. These results vary less than 5 per cent from the measurements at the Upper Narrows by the Geological Survey.

A report of J. B. Lippincott gives some discharges interpolated from the ratio of flow at the Forks to that of the upper tributaries for seasons where the records are available for comparison. Table No. 23 shows these interpolated results and those based on the flow at the Upper Narrows, although obtained in widely different manner, to be in reasonably close agreement. There are no complete measurements for the Forks or either the Upper or Lower Narrows for 1897-8 and 1898-9 and the interpolated values deduced by Mr. Lippincott are assumed to be correct.

TABLE No. 23.

Interpolated Discharge of Mojave River.

Season	Discharge at Forks interpolated from discharge of upper tributaries (Acre feet)	Discharge at Forks interpolated from discharge at Upper Narrows (Acre feet)
1897–1898	27,040	27,040
1898–1899	7,710	13,898
1899–1900	20,000	18,132
1900–1901	108,100	96,598
1901–1902	33,610	33,789
1902–1903	111,800	107,315
1903–1904	35,210	28,232
1904–1905	103,294	95,016

In this manner Table No. 24 of discharges of Mojave River at the Forks has been compiled for the 18 seasons 1897-8 to 1914-15, inclusive. The average annual discharge of the river where it enters the Victor Valley basin is shown to be approximately 90,000 acre-feet.

TABLE No. 24.

Discharge of Mojave River at Forks—1897-1915, Inclusive.

Season	Discharge (Acre feet)
1897–1898	27,040
1898–1899	13,878
1899–1900	18,132
1900–1901	96,598
1901–1902	33,789
1902–1903	107,315
1903–1904	28,232
1904–1905	95,016
1905–1906	135,220
1906–1907	254,317
1907–1908	60,776
1908–1909	69,740
1909–1910	135,705
1910–1911	147,938
1911–1912	46,964
1912–1913	26,360
1913–1914	169,935
1914–1915	122,636
Average	89,416

FORKS RESERVOIR SITE.

The reservoir site on the West Fork of Mojave River just above the Forks may be designated West Fork reservoir site No. 1, or as it is generally know, the Forks reservoir site. The land in this basin, or nearly all of it including the dam site, is controlled by the Arrowhead Reservoir and Power Company. It was the original plan of the Mojave River Irrigation District to acquire and develop this site to impound the flood discharge of the West Fork and to store, by diversion, that in the lower part of the East Fork and to convey the water by gravity to the east mesa. The district, however, did not make known definite design, if any was decided upon, for the imporvement of the site.

The Arrowhead company has proposed a dam at the Fork site (Plate IV, Fig. 2) 150 feet high which would give a capacity of 102,000 acre-feet for storing both East and West Fork flood waters. Borings made by the company at the dam site show bedrock to be at a maximum depth of 18 feet below stream bed. The natural rim of the basin at one point is only 110 feet above the stream channel at the dam site and the plans include the necesary raising of this bank 50 feet to give the desired capacity. The bank is here merely a narrow remnant of detrital deposit between the channel of the West Fork and the channel of the main river at a lower elevation than the West Fork. The peculiar topography of this locality can be best understood by reference to the map. The only foundation for a dam to raise the bank, as shown by excavations made by the company, is a layer of hardpan at a depth of 75 feet below the crest of the rim.

Moderate leakage, provided the water reappeared as surface flow in the river, might not be a sufficient reason for condemning the site, for the water lost would help satisfy the owners of riparian lands and the appropriators on the stream below, but excessive leakage would impair the value of the reservoir. Robert T. Hill reported to the commission on the geology of the site as follows:

"The Forks reservoir site is an elongated basin which has been developed by erosion at the junction of the north side of the San Bernardino Range and the southern margin of the so-called Mojave Desert. It is triangular in shape and about five miles long, in a northeast-southwest direction, and about two miles in width at its widest place. It is bordered on the southeast and southwest sides by the high, and somewhat precipitous north front of the San Bernardino Range, and on the north by the even topped escarpment of the south side of the Mojave plain, which slopes away therefrom to the northeast. The floor of this basin, which is some 250 feet beneath the summit of this escarpment, shows several old levels and terraces of alluvial material, below which the river has cut to its present level close to the northern wall.

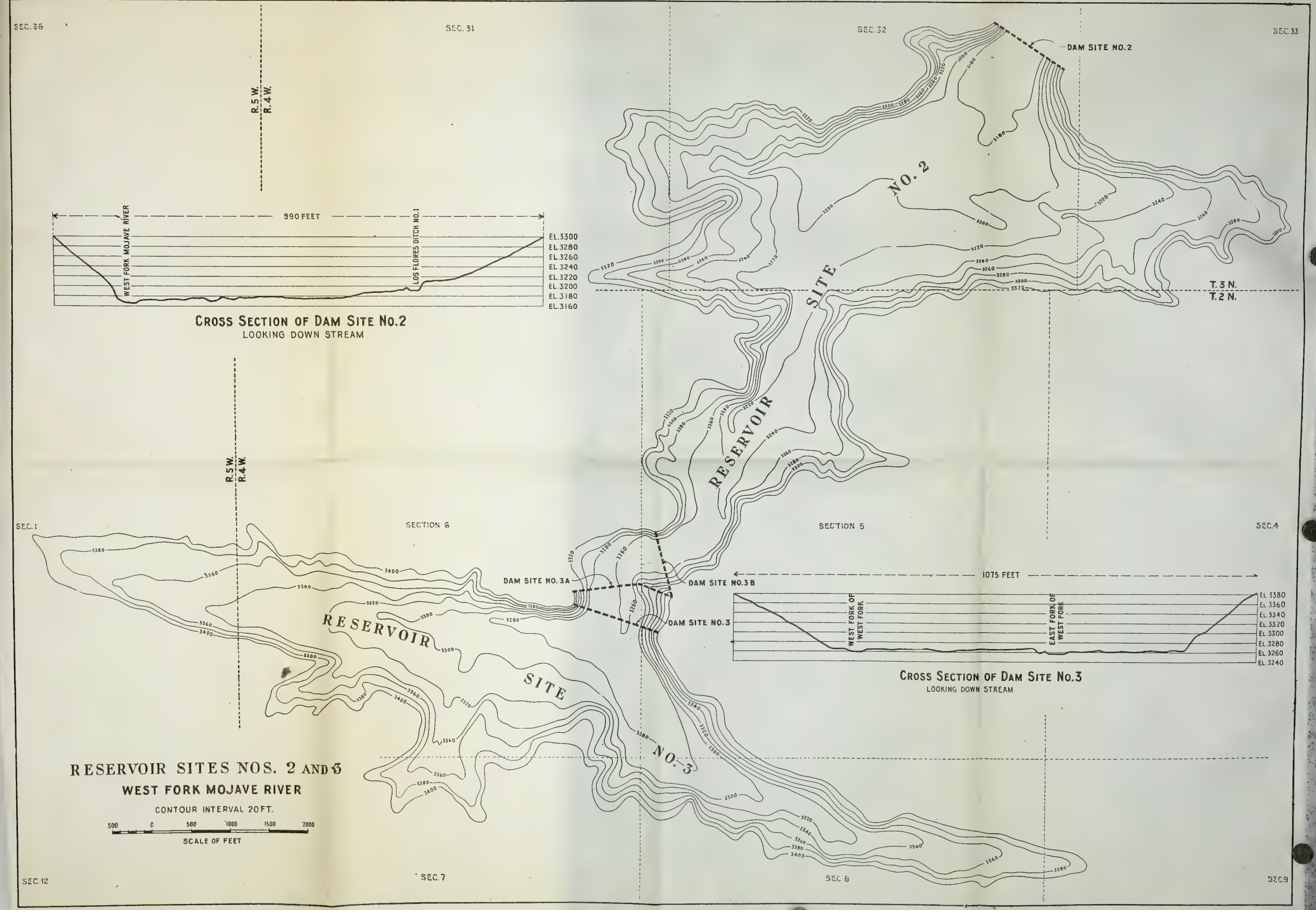
"The northeast end of the basin is closed by a natural dam which has only recently in geological time been cut through by a deep gorge at its southern end through which the river now finds an outlet. The eastern end of this dam is a low conical granitic peak, which sets out from the edge of the main escarpment of the mountain, while the western half is a low residual embankment which represents the former continuation of the north wall to a junction with the granite outlier above mentioned. The top of this natural embankment is perhaps a hundred feet lower than that of the main northern escarpment.

"The Mojave River now escapes from the basin at the east end of this natural barrier by a deep and narrow canyon in the granite, in which it is proposed to construct a dam for the retention of the water in the reservoir. In my opinion this granite is an excellent site for a dam (Plate IV, Fig. 2), and there are no geological reasons why one should not be constructed here.

"The southern or mountain side of the basin is composed almost exclusively of a granitic rock characterized by large phenocrysts of pink orthoclase feldspar associated with a finer ground mass of plagioclase and biotite, and which may be termed a biotite quartz mononite porphyry in contradistinction from the gray granite in the Victorville hills which is a granodiorite. Like all the granite masses of the desert side whose surfaces are exposed to the weather, this rock is much jointed and broken at the surface by the expansion and contraction due to the diurnal variations of temperature, but the joints will be found closed at slight depths. In general, it may be considered a highly impervious material, well adapted for retaining water when the latter is impounded against it, and also excellent material upon which to construct dams.

"The north escarpment of the basin consists of a steeply sloping cliff of the so-called Hesperia formation, which at one place affords a fresh exposure in a vertical cliff nearly 200 feet in height. Here it is seen to consist of alternating beds of varying thickness of coarse unconsolidated gray angular sands and slightly reddish colored sands containing a very small amount of clay. These beds dip slightly to the north. They are very porous, much more so than is desirable, and the question of leakage through them is a subject which deserves serious consideration before reaching final conclusions as to the availability of this basin for a reservoir site.

"That portion of the northeast barrier of the basin which is composed of the Hesperia formation is the weakest link in the valley wall. It is not only porous like the main north wall, but it is narrow and bordered by lower land on its downstream side. Also I doubt if it will afford a



RESERVOIR SITES NOS. 2 AND 3
WEST FORK MOJAVE RIVER

CONTOUR INTERVAL 20 FT.

suitable foundation for constructing a higher dam at this point. Serious study should be given to the capacity of this section for the inhibition and transmission of water."

UPPER WEST FORK RESERVOIR SITES.

Two sites for reservoirs shown by the map, Plate VII, are located on the upper part of the West Fork of Mojave River. For the purpose of reference, these reservoir sites have been designated as West Fork Reservoir No. 2, and West Fork Reservoir No. 3, in order of location looking upstream. The commission made surveys of these for the plotting of ten-foot contours, but the scale of the map, Plate VII, does not permit showing more than each 20-foot contour. Area and capacity curves for these sites are shown by Fig. 4 and Fig. 5.

Three locations for the dam were considered for Reservoir No. 3. The first, designated as Dam Site No. 3, was abandoned in favor of another further down stream, which appeared more advantageous, and which was designated as Dam Site No. 3-A. The cost for the reservoir was worked up on the basis of using this site No. 3-A. Later it was discovered that saving could be made by shifting still further downstream to a point which has been designated as Dam Site No. 3-B, and it is this location which would be recommended, subject to satisfactory examination by test borings, as the place for a dam.

The report of Robert T. Hill, consulting geologist, on Dam Sites Nos. 2, 3-A and 3-B is as follows:

"I examined the geological conditions of the proposed dam sites within the northern edge of the mountain area along the course of the West Fork of the Mojave River. These sites are three in number, and consist of narrow constrictions of the canyon walls which are to be the dam sites, alternating with wide expansions of the valley which are to constitute the reservoir sites. These dam sites (Plate III, Fig. 2, and Plate IV, Fig. 1) are strongly entrenched ridges of the same granitic rock as that which we have previously described, and there are no geological reasons why they should not be considered excellent locations for the contemplated works.

"Some fear has been expressed regarding the proximity of the dam sites to the fault lines which seem to dominate the physiography of this district. It is my opinion that no serious trouble need necessarily be anticipated from these conditions. The displacements seem to be ancient in comparison to those now taking place on the southwest side of the range. There are no large or open fault fissures which would be conducive to leakage. The only danger would be that of earthquake jars to masonry dams, and so far as is ascertained, this particular area is about as free from seismic disturbances as any part of southern California.''

To obtain some standard for ready comparison a safe section of gravity dam is assumed, all dimensions of which are expressed in terms of the height. The top width is .15h and this continues down for a depth of .20h from whence the section widens in the form of a trapezoid to .65h at the base. The area of cross section thus provided is $.33h^2$. While not the most effective or economical dam it is sufficiently strong and it offers a section for preliminary comparison of one dam with another. Cross sections of the dam sites as shown by Plate VII were taken and as careful examinations as could be made for dams for varying dimensions.

In order to present the results in the form of cost curves rather than yardage curves a cost of $6.00 per cubic yard was assumed for all concrete. The cost of the dams was then computed for heights from 10 to 150 feet and the unit cost was determined for the different capacities. The unit costs for different capacities when plotted give a fairly uniform curve. Fig. 4 shows area, capacity, and cost curves for the reservoirs, area being plotted against depth, capacity against depth, and unit cost against capacity. The unit cost curves are then used to make Fig. 5 in which the several curves represent different combined capacities for the reservoirs and in which the diagrams show the capacity that should be given each reservoir for the most economic combination together with the corresponding unit cost. The curve at the bottom of Fig. 5 is a summary of those above, and shows the unit cost in dollars per acre-foot for the most economic combined capacities in acre-feet. It is found that the most economic combinations within the range of total storage which would be desirable require that the greater part of the capacity be in Reservoir No. 3-A, also that the ratio between the capacities of the two basins is not constant for varying total capacity.

The maximum economic capacity for Reservoir No. 3-A is approximately 35,000 acre-feet which is shown to correspond to the minimum unit cost of $34.50 per acre-foot. Using the same figure as the maximum allowable unit cost for Reservoir No. 2 the maximum economic capacity for this reservoir is 34,000 acre-feet. Again considering the same unit cost as the limit of expense the minimum economic capacity for Reservoir No. 3-A is 28,000 acre-feet and for Reservoir No. 2, 9,400 acre-feet.

Either of these sites is suitable to serve as the reservoir for the first unit in the development of a project and it is gratifying to find such possibilities for economic storage based on such small units. It is in these units that hope for a successful project in Victor Valley must lie

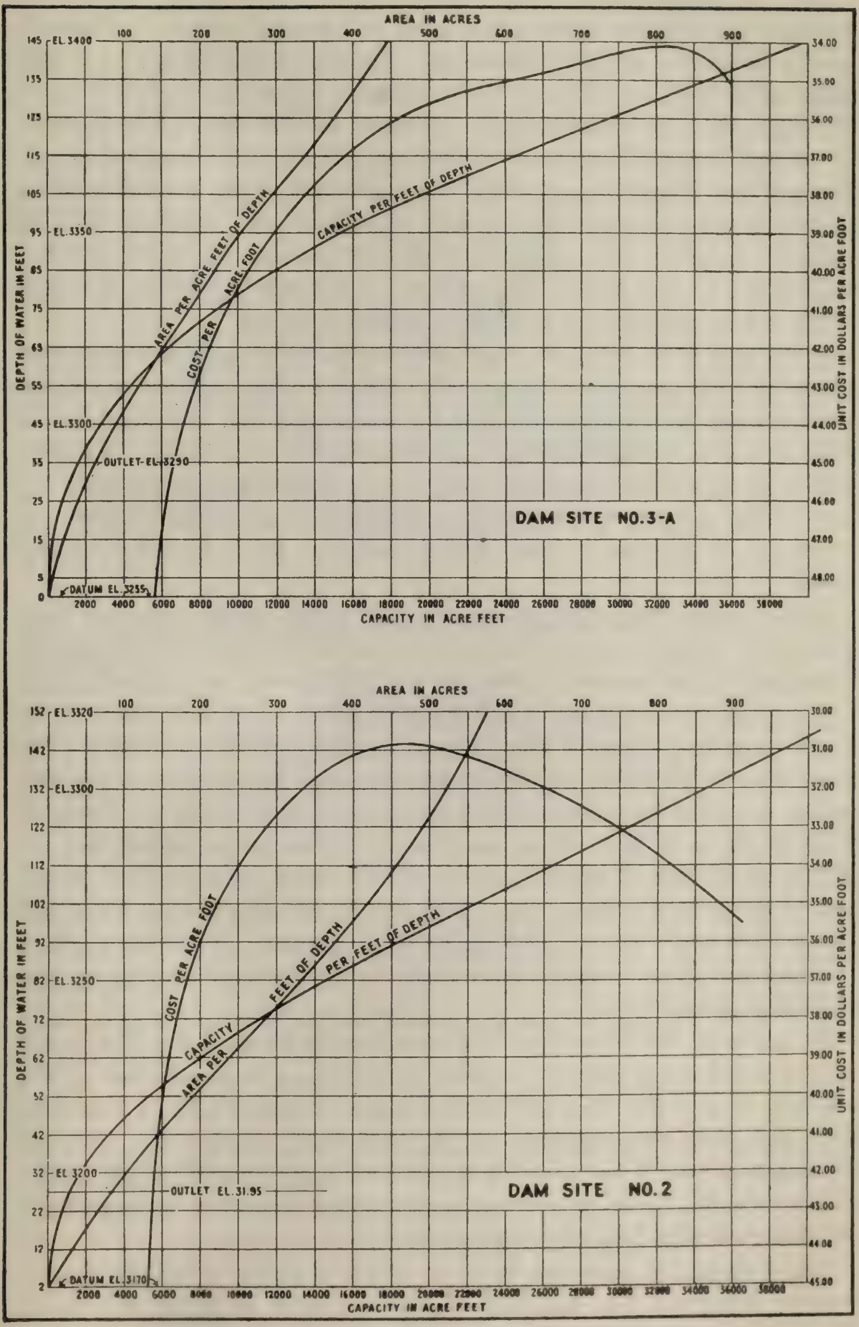


Fig. 4.—Area, capacity, and cost curves for reservoir sites.

For the complete and most economic utilization of the West Fork waters a much larger storage is needed and a combination of these reservoirs offers the means to this end. The curve, Fig. 5, shows a wide range of capacity to be possible through advantageous combinations of the two reservoirs without much variation in unit cost. For example, by proper combination a total capacity of 60,000 acre-feet can be obtained for approximately $33.25 per acre-foot while a total capacity of only 31,000 acre-feet can be had for $34.00 per acre-foot, with an optimum economic total capacity between these two of 52,000 acre-feet for $32.85 per acre-foot. This indicates a possible flexibility of design which is very desirable and which is seldom obtained.

If the area to be first put under cultivation is too large it may become unwieldy with nonproductive acreage and difficult to carry through the development period while if it be too small the first cost may be too high and the overhead charges proportionately too large. Where a project offers such nearly equal unit cost for varying sizes, the first unit may be conveniently given the most desirable size. In the present case an initial or nucleus project should comprise from 15,000 to 18,000 acres.

With a gross duty of 1.25 acre-feet the water supply required for a district of 16,500 acres, or assuming that 15 per cent of the land is unirrigated, a net area of 14,000 acres is 17,500 acre-feet annually.

The mean annual discharge of the West Fork of Mojave River at the Forks including Grass Valley Creek is about 39,200 acre-feet. The mean annual discharge at the upper dam sites as determined by comparing the measurements at the upper sites with those at the Forks, is about 30,000 acre-feet. It appears from the discharge records that for an annual storage of approximately 30,000 acre-feet, a draft of 60 per cent of the total storage or approximately 18,000 acre-feet per year may safely be made. This is sufficient for a net area of 14,000 acres or allowing for 15 per cent of the district being unirrigated a gross area of 16,500 acres.

If, however, Reservoir No. 3-A only should be used for this initial project some study should be made of the most economic use of this reservoir and of the form of unit development that would be consistent with the full development of the combined reservoirs. Ultimate development would use the full 60,000 acre-feet capacity which should give an annual draft of approximately 30,000 acre-feet or practically the entire average flow of the West Fork.

Fig. 5 shows the economic division of this capacity to be 33,000 acre-feet in Reservoir No. 3-A and 27,000 acre-feet in Reservoir No. 2. Therefore, as a tentative plan it is suggested that Reservoir No. 3-A be constructed to a capacity of 33,000 acre-feet for the first unit. This

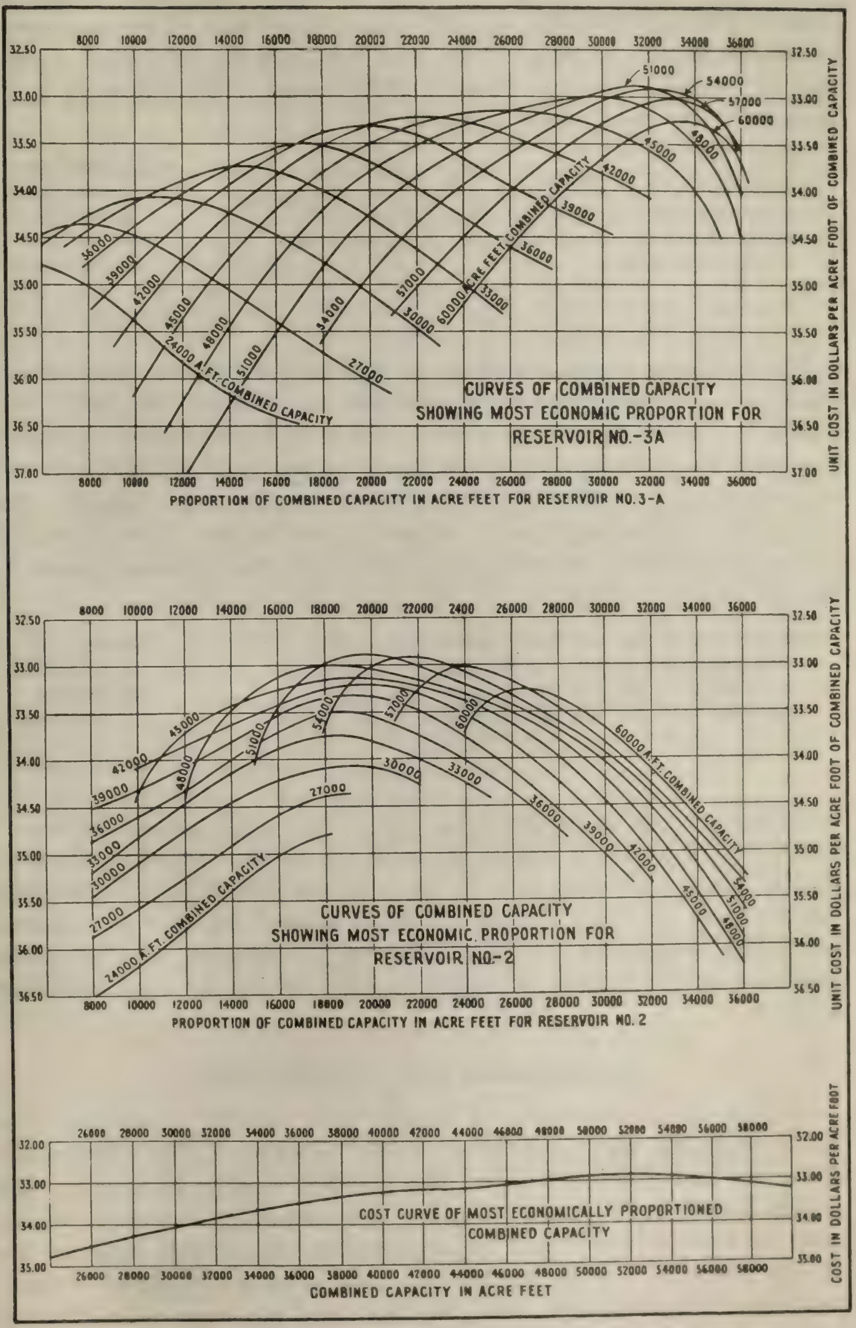


Fig. 5.—Curves for reservoir sites on West Fork of Mojave River.

should allow a safe annual draft of about 20,000 acre-feet or on the basis of 1.25 acre-feet duty should irrigate a net area of the west mesa of 16,000 acres, or allowing 15 per cent for lands not cultivated, should supply a district of approximately 19,000 acres. The following is an estimate of the cost of such a project:

Dam	$1,125,300 00
Spillway	20,000 00
Land, 400 acres at $100 per acre	40,000 00
Main conduits	198,000 00
Distribution system	322,000 00
Total	$1,705,300 00

The foregoing makes no allowance for interest during construction which would require two years. During the first six months of this period it is probable that the work would be of a preliminary character including the making of the necessary surveys and designs and the acquisition of the lands and water rights pertaining to the project. The cost of this preliminary work is estimated at $100,000. For a tentative scheme of financing therefore it is estimated that interest would be paid on sums as follows:

$100,000 at 5 per cent for 2 years	$10,000 00
500,000 at 5 per cent for 1½ years	37,500 00
600,000 at 5 per cent for 1 year	30,000 00
600,000 at 5 per cent for ½ year	15,000 00
Total	$92,500 00

Adding interest to construction cost gives a total estimated cost of $1,797,800, or a cost of $94.62 per acre. A careful design of the dam should reduce the estimated cost 10 or 15 per cent below the estimate based on the arbitrary section of dam assumed for this preliminary study and comparison. Such a reduction would lower the estimated unit cost of the project to approximately $90.00 per acre including interest.

CONCLUSIONS AND SUGGESTIONS.

No plan for the utilization of Mojave River would be complete without considering the Little Bear Valley Reservoir. The Arrowhead Reservoir and Power Company has invested a large amount in this system for impounding and using the water supply of the upper watershed of the East Fork and is in possession of valuable data on the runoff from the entire watershed. This company controls a large amount of riparian land along the river and has acquired additional appropriation rights. Options on the company's properties are held by the Victor Valley Irrigation District. It is not evident that this district can be properly supplied with water from Little Bear Valley reservoir at reasonable cost. The length of conduit and the expensive nature of construction required, the limited quantity of water available and the comparatively small amount of power which may be developed point to such a large unit cost as to render the project impracticable. The report of J. B. Lippincott points out that the project is feasible only on the basis of a high duty of water such as one acre-foot and indicates uncertainty as to the sufficiency of this duty. We are of the opinion that a duty of one acre-foot is insufficient for the area included in the district.

We deem it unwise to give special consideration to any particular body of land and hold that the broad problem is not how to deliver the water to some particular lands but how to devise the most economical plan to properly irrigate part of the valley. There is a large area of land but a limited quantity of water.

The flood waters may also be stored at the Victor reservoir site controlled by the Mojave Water and Power Company and although this site is too low to be of service to either of the irrigation districts, plenty of good land on which the water may be used is situated below the site.

In the pursuit of practical means for the utilization of Little Bear Valley Reservoir we suggest that some land of the east mesa may be irrigated with this supply at less expense than may the lands of the west mesa and that such a distribution would also permit the development of more electrical energy. The West Fork reservoir sites may be used to store water for the west mesa lands.

The Appleton Land, Water and Power Company owns extensive lands having riparian rights and some appropriation rights and the pipe lines of this company are in a position to receive the discharge from Little Bear Valley reservoir. For the nucleus of development on the east side and near the river on the west side it would seem that this company's ditch and pipe lines might have a very definite value if used with the Arrowhead Reservoir and Power Company's properties.

The following is a summary of the suggestions and findings.

(1) The proper duty of water is approximately 1.50 acre-feet per acre per annum for the east mesa and 1.25 acre-feet per acre per annum for the west mesa.

(2) The total annual average discharge of Mojave River is approximately 90,000 acre-feet, of which about one-third is available for storage in Little Bear Valley reservoir now partially constructed, about one-third is available for storage in proposed upper West Fork reservoirs, and about one-third should be allowed for the riparian lands along the river.

(3) We suggest the use of the water supply under two projects; one for the west mesa to make use of the upper West Fork reservoirs with an initial unit having storage in Reservoir No. 3-A of 33,000 acre-feet and a district of 18,400 acres and an ultimate project with storage in both reservoirs of 60,000 acre-feet and a district of 29,000 acres; the other to use Little Bear Valley reservoir water from which may be delivered by the shortest route to the lands of the east mesa, utilizing the greater inherent power en route and irrigating approximately 20,000 acres net, or allowing for 15 per cent of the total being unirrigated, a total project area of 23,000 acres. The total net area under the two systems would be about 45,000 acres and allowing 15 per cent for lands unirrigated within the exterior boundaries a total gross area of about 52,000 acres.

APPENDIX

TABLE OF DATA ON WELLS AND PUMPING PLANTS IN VICTOR VALLEY.

Number	Owner	Location			Well						Elevations		Pump			Power	
		Section	Township	Range	Year made	Class	Size, inches	Depth, feet	Depth to water feet	Date measured	Ground, feet	Water, feet	Kind	Size, inches	Discharge claimed, mi. in.	Kind	Horsepower
1	Martin McInnis	7	3	3		Dug		22	7.5	Feb. 26, '17	2,945.8	2,938.3	Cylinder			Windmill	
2	Martin McInnis	7	3	3	1913	Dug		30	10.4	Feb. 26, '17			Cylinder			Windmill	
3	A. Dewitt	7	3	3		Dug		11	8.3	Feb. 26, '17	2,944.4	2,936.1	None			None	
4	— Vlodek	6	3	3		Dug		20	2.8	Feb. 26, '17	2,931.4	2.928.6	None			None	
5	C. F. Hedrick	1	3	4	1916	Drilled	10	216	11.0	Feb. 16, '17	2,935.1	2,924.1	Centrifugal	6	80	Gasoline engine	20
6	F. Spencer	1	3	4	1916	Drilled	12	250	11.0	Feb. 16, '17	2,927.4	2,916.4	Centrifugal	7	100	Gasoline engine	25
7	—— ——	1	3	4		Dug					2,922.9		Cylinder			Windmill	
8	M. J. Springer	6	3	3		Dug			5.7	Feb. 26, '17			None			None	
9	Appleton L. W. P. Co.	36	4	4		Drilled	14	113	3.5	Feb. 17, '17			None			None	
10	Appleton L. W. P. Co.	36	4	4		Drilled	14	202		Feb. 17, '17			None			None	
11	Appleton L. W. P. Co.	36	4	4		Drilled	14	280	6.2	Feb. 17, '17	2,927.0	2,920.8	None			None	
12	I. C. McLaughlin	31	4	3	1905	Drilled	14	34	34.0	Feb. 26, '17	2,910.0	2,876.0	Cylinder			Windmill	
13	I. C. McLaughlin	31	4	3	1911	Drilled	8	52	20.9	Feb. 26, '17	2,913.5	2,892.6	Centrifugal	4	52	Gasoline engine	8
14	A. O'Neil	30	4	3	1911	Drilled	12	225	16.4	Feb. 26, '17	2,897.7	2,881.3	Centrifugal		140	Gasoline engine	25
15	A. W. Cole	30	4	3	1914	Dug		36	31.7	Mar. 6, '17	2,897.7	2,866.0	Cylinder	5x24	7	Gasoline engine	3
16	A. W. Cole	30	4	3	1913	Drilled	12	162	32.8	Mar. 6, '17	2,898.0	2,865.2	Centrifugal	5	80	Gasoline engine	25
17	County Well	19	4	3		Dug			12.6	Mar. 6, '17	2,899.9	2,887.3	None			None	
18	G. W. McLester	19	4	3		Drilled	10	6	22.7	Feb. 26, '17			None			None	
19	G. W. McLester	19	4	3		Drilled	12		22.7	Feb. 26, '17			None			None	
20	H. A. Jock	30	4	4		Drilled	10	54	18.0		2,905.2	2.887.2	Cylinder	3	35	Gasoline engine	6
21	O. A. Minister	29	4	3		Dug			30.0		2,896.3	2.866.3	Cylinder		9	Gasoline engine	1.5
22	O. A. Minister	29	4	3	1913	Drilled	12	120	24.3	Feb. 25, '17	2,891.2	2,866.9	Centrifugal	6	150	Gasoline engine	22
23	Sidney O'Neil	20	4	3		Drilled	12		24.5	Feb. 26. '17	2,882.1	2,867.6	None			None	
24	J. M. Allison	20	4	3		Drilled	10	70	30.0		2,880.1	2,850.1	None			None	
25	J. M. Allison	20	4	3		Drilled	10	70	25.0		2,883.4	2,858.4	None			None	
26	W. C. Roberts	17	4	3	1915	Drilled	12	155	20.0		2,868.5	2,848.5	Centrifugal	6	125	Gasoline engine	20
27	D. W. McPherson	17	4	3		Drilled	7		20.4	Feb. 25, '17	2,862.4	2.842.0	Cylinder			Windmill	
28	D. W. McPherson	17	4	3	1914	Drilled	12		20.6	Feb. 25, '17	2,866.8	2,846.2	None			None	
29	I. K. Miller	7	4	3		Drilled	10	150	19.5	Feb. 25, '17	2,861.9	2,842.4	Centrifugal	8		Gasoline engine	
30	C. G. Lewis	7	4	3	1910	Drilled	12	146	12.0		2,854.6	2,842.6	Centrifugal	4	55	Gasoline engine	8
31	H. A. Carden	7	4	3		Drilled	10	225	15.1	Feb. 25, '17	2,853.7	2,838.6	Centrifugal	7		Gasoline engine	20
32	Harris Garcelon	6	4	3	1909	Drilled	12	133	16.0		2,842.9	2,826.9	Centrifugal	6	130	Gasoline engine	16

33	E. Garcelon	7	4	3	1912	Drilled	12	166	10.0	------	2,848.8	2,838.8	Centrifugal	7	150	Gasoline engine	25
34	A. H. Hohman	6	4	2	------	Dug	------	25	11.8	Feb. 24, '17	2,833.7	2,821.9	Centrifugal	3	24	Gasoline engine	4
35	A. W. Phillips	6	4	3	------	Drilled	12	94	8.0	------	2,830.5	2,822.5	Centrifugal	6	216	Gasoline engine	35
36	Orr & Pullar	36	5	4	1909	Drilled	12	110	7.0	Feb. 17, '17	2,825.2	2,818.2	Centrifugal	5	75	Gasoline engine	45
37	Verde Ranch	23	5	4	------	Drilled	10	260	0.0	April 12, '17	2,751.5	2,751.5	Flowing	------	------	None	----
38	Verde Ranch	23	5	4	------	Drilled	10	350	0.0	April 12, '17	2,748.6	2,751.3	Flowing	------	33	None	----
39	Verde Ranch	23	5	4	------	Drilled	10	92	0.0	April 12, '17	2.750.2	2,751.8	Flowing	------	------	None	----
40	Verde Ranch	15	5	4	------	Drilled	10	------	0.0	April 12, '17	2,765.0	2,776.9	Auxiliary pump	------	------	Gasoline engine	----
41	Verde Ranch	26	5	4	------	Drilled	10	552	0.0	April 12, '17	2,782.1	2,783.5	Flowing	------	------	None	----
42	Verde Ranch	26	5	4	------	Drilled	10	------	0.0	April 12, '17	2,782.1	2,783.3	Flowing	------	------	None	----
43	Verde Ranch	26	5	4	------	Drilled	10	106	0.0	April 12, '17	2,783.3	2,784.4	Flowing	------	------	None	----
44	Verde Ranch	26	5	4	------	Drilled	10	------	0.0	April 12, '17	2,798.4	2,799.6	Flowing	------	------	None	----
45	Verde Ranch	26	5	4	------	Drilled	10	------	0.0	April 12, '17	------	------	Flowing	------	------	None	----
46	Verde Ranch	35	5	4	------	Drilled	10	------	0.0	April 12, '17	2,800.4	2,804.3	Flowing	------	------	None	----
47	Verde Ranch	35	5	4	------	Drilled	10	895	0.0	April 12, '17	2,799.1	2,800.4	Flowing	------	------	None	----
48	Verde Ranch	35	5	4	------	Drilled	10	------	0.0	April 12, '17	2,800.2	2,800.7	Flowing	------	------	None	----
49	Verde Ranch	35	5	4	------	Drilled	12	270	4.0	April 12, '17	2,811.0	2,807.0	Centrifugal	------	350	Gasoline engine	60
50	Verde Ranch	35	5	4	------	Drilled	12	270	4.0	April 12, '17	2,811.0	2,807.0	Centrifugal	------	350	Gasoline engine	60
51	Verde Ranch	35	5	4	------	Drilled	12	270	4.0	April 12, '17	2,811.0	2,807.0	Centrifugal	------	350	Gasoline engine	60
52	Verde Ranch	35	5	4	------	Drilled	12	306	4.0	April 12, '17	------	------	Centrifugal	8	------	Gasoline engine	25
53	Verde Ranch	36	5	4	------	Drilled	12	270	12.8	Mar. 5, '17	2,824.0	2,811.2	Centrifugal	12	400	Gasoline engine	60
54	Verde Ranch	36	5	4	------	Drilled	12	270	12.8	Mar. 5, '17	2,824.0	2,811.2	Centrifugal	12	400	Gasoline engine	60
55	Verde Ranch	36	5	4	------	Drilled	12	270	12.8	Mar. 5, '17	2,824.0	2,811.2	Centrifugal	12	400	Gasoline engine	60
56	W. and C. H. Shaw	24	5	4	------	Drilled	14	72	53.0	Feb. 17, '17	2,815.7	2.762.7	Cylinder	------	------	Windmill	----
57	W. and G. Weldon	24	5	4	------	Drilled	12	300	50.0	------	2,801.7	2.751.7	Centrifugal	------	------	Gasoline engine	32
58	W. A. Foster	25	5	4	1907	Drilled	10	100	48.0	------	2,833.0	2,785.0	Centrifugal	6	100	Gasoline engine	35
59	M. L. Foster	19	5	4	------	Drilled	------	160	48.0	------	2,835.0	2,787.0	Double dp. w.	------	40	Gasoline engine	15
60	E. P. Dewey	31	5	3	1903	Drilled	8	545	23.5	Feb. 24, '17	2,850.0	2,826.5	Centrifugal	6	125	Gasoline engine	----
61	Victor Ranch	30	5	3	1905	Drilled	12	500	55.3	Feb. 24, '17	2,845.8	2,789.5	Centrifugal	7	125	Gasoline engine	40
62	W. B. Ames	30	5	3	------	Drilled	12	------	47.6	Feb. 24, '17	2,845.8	2,797.2	Centrifugal	7	------	Gasoline engine	40
63	W. B. Ames	30	5	3	------	Drilled	12	------	47.6	Feb. 24, '17	2,848.0	2,800.4	Centrifugal	7	------	Gasoline engine	32
64	W. C. Smith	31	5	3	------	Drilled	12	------	------	------	------	------	None	------	------	None	----
65	S. L. Wheatley	31	5	3	------	Drilled	12	------	45.3	Feb. 24, '17	2,863.8	2,818.5	Centrifugal	------	------	Gasoline engine	35
66	L. C. Bailey	31	5	3	------	Drilled	------	------	------	------	2,865.0	------	Centrifugal	------	------	Gasoline engine	18
67	A. W. Phillips	6	4	3	------	Drilled	10	100	50.0	Feb. 24, '17	2,866.5	2,816.5	Cylinder	------	6	Gasoline engine	----
68	G. L. Smith	6	4	3	------	Drilled	12	100	50.0	------	2,878.7	2,828.7	Centrifugal	7	------	Gasoline engine	40
69	W. A. Westphal	5	4	3	1910	Drilled	12	370	80.0	------	2,923.4	2,843.4	Centrifugal	6	80	Gasoline engine	40
70	Apple Valley School	5	4	3	------	Drilled	7	160	100.0	------	2,923.8	2,823.8	Cylinder	------	------	Windmill	----
71	Edwin Rhodes	8	4	3	1914	Drilled	14	164	71.0	------	2,904.1	2,833.1	Turbine	10	100	Gasoline engine	35
72	—— Cozard	7	4	3	------	Dug	------	48	46.8	Feb. 25, '17	2,880.4	2,833.6	Cylinder	------	------	Windmill	----
73	—— Keplinger	8	4	3	------	Dug	------	------	66.0	Feb. 25, '17	2,901.3	2.838.3	Cylinder	------	------	Windmill	---

TABLE OF DATA ON WELLS AND PUMPING PLANTS IN VICTOR VALLEY—Continued.

Number	Owner	Location			Well						Elevations		Pump			Power	
		Section	Township	Range	Year made	Class	Size, inches	Depth, feet	Depth to water feet	Date measured	Ground, feet	Water, feet	Kind	Size, inches	Discharge claimed, mi. in.	Kind	Horsepower
74	C. F. Ten Eyck	8	4	3	1915	Drilled	14	225	132.0				Turbine	12	45	Gasoline engine	42
75	F. E. Harrison	17	4	3	1912	Dug		81	78.2	Feb. 26, '17			Cylinder			Windmill	
76	N. F. Marsh	20	4	3	1915	Drilled	12	180	100.0		2,969.0	2,869.0	Screw	5	32	Gasoline engine	30
77	W. O. Wade	21	4	3	1916	Drilled	12	650	242.0	Mar. 1, '17	3,090.0	2,848.0	Cylinder			Gasoline engine	2
78	W. C. Harris	8	4	3	1912	Drilled	14	345	186.2	Mar. 1, '17	3,030.9	2,844.7	Single dp. w.	9x30	30	Gasoline engine	30
79	A. E. Hull	9	4	3	1912	Drilled	14	687	188.9	Mar. 1, '17	3,033.9	2,845.0	Centrifugal	5	55	Gasoline engine	60
80	W. M. Hunt, Jr.	10	4	3		Drilled	14	300	212.0	Mar. 1, '17	3,060.4	2,848.4	Double dp. w.	38	42	Gasoline engine	40
81	W. E. Tussing	10	4	3	1917	Drilled	12	385	138.0		3,090.0	2,852.0	Double dp. w.	28	27	Gasoline engine	30
82	R. M. Ferguson	5	4	3	1911	Drilled		272	166.0				None			None	
83	O. L. Morgan	4	4	3	1913	Dug			170.0				Cylinder			Windmill	
84	H. W. Fitzpatrick	4	4	3	1912	Dug			5.0		2,992.9	2,837.9	None			None	
85	J. Billingsley	3	4	3		Dug			149.0	Mar. 3, '17	2,978.9	2,829.9	None			None	
86	O. A. Bonadiman	3	4	3		Drilled		241	190.0		3,030.8	2,840.8	Cylinder			Windmill	
87	T. E. Dennison	2	4	3	1909	Drilled	6	180	159.0		2,997.6	2,838.6	Cylinder			Windmill	
88	J. F. Olsen	2	4	3	1911	Dug		167	159.0		2,995.6	2,836.6	Cylinder			Windmill	
89	W. J. Fifield	2	4	3		Drilled	10		213.0	Mar. 2, '17	3,053.0	2,840.0	Cylinder			Windmill	
90	E. D. S. Pope	1	4	3	1913	Drilled	12	730	196.0		3,037.0	2,841.0	Double dp. w.		10	Gasoline engine	12
91	D. D. Spaid	1	4	3	1914	Drilled	12	250	163.0				Screw	6	30	Gasoline engine	40
92	H. E. Walsh	6	4	2	1914	Drilled	12	340	200.0		3,125.0	2,844.0	Double dp. w.	38	33	Gasoline engine	40
93	A. J. Lintner	6	4	2		Drilled	8		200.0	Mar. 4, '17	3,030.0	2,832.0	None			None	
94	B. Peaks	26	5	3		Dug		150	100.0		2,946.8	2,846.8	Cylinder			Gasoline engine	
95	A. M. Byron	34	5	3	1912	Dug		148	128.5	Feb. 28, '17	2,967.0	2,838.5	Cylinder			Windmill	
96	L. H. Olock	33	5	3	1913	Drilled	12	512	155.2		2,985.2	2,830.0	None			None	
97	O. H. White	5	4	3	1915	Drilled	12	204	166.0		3,002.1	2,836.1	Deep well	6	8	Gasoline engine	7
98	T. J. Anderson	33	5	3		Dug		167	157.4	Feb. 17, '17	2,987.3	2,829.9	None			None	
99	W. Paine	32	5	3		Dug		167	160.0		2,994.5	2,834.5	Cylinder			Windmill	
100	M. F. Ihmsen	32	5	3	1912	Drilled	14	300	164.0		2,994.7	2,830.7	Turbine	12	70	Gasoline engine	60
101	Theresa Smith	32	5	3	1915	Drilled	12	269	151.8	Feb. 27, '17	2,986.8	2,835.0	None			None	
102	A. S. Kibbey	28	5	3	1910	Drilled	10	400	130.0		2,975.9	2,845.9	Turbine	9⅝	53	Gasoline engine	35
103	K. Evans	29	5	3	1915	Drilled	12	207	155.0		2,968.0	2,818.0	Deep well		15	Gasoline engine	4
104	A. G. Kent	27	5	3	1916	Drilled	12	253	127.0				None			None	
105	W. W. Hitchcock	28	5	3	1912	Drilled	14	492	112.0	May 15, '12	2,951.5	2,839.5	Turbine	8	50	Gasoline engine	40

106	H. C. Decker	22	5	3	1909	Drilled	10	722	107.7	Feb. 28, '17	2,944.7	2,837.0	Air lift	------	------	None	----
107	N. Elmer	22	5	3	------	Dug	------	119	101.9	Mar. 2, '17	2,939.0	2,837.1	None	------	------	None	----
108	L. L. Lytle	26	5	3	------	Dug	------	101	98.3	Mar. 2, '17	2,939.0	2,840.7	None	------	------	Gasoline engine	----
109	R. D. Sperry	26	5	3	------	Dug	------	111	97.8	Mar. 2, '17	2,938.4	2,840.6	None	------	------	None	----
110	H. Meacham	30	5	2	------	Drilled	10	------	109.0	Mar. 3, '17	2,960.0	2,851.0	None	------	------	None	----
111	—— Rau	24	5	3	1917	Drilled	12	183	87.1	Mar. 2, '17	------	------	None	------	------	None	----
112	—— Harlan	24	5	3	------	Drilled	12	155	81.8	Mar. 4, '17	------	------	Cylinder	------	------	None	----
113	Verde Ranch	24	5	3	------	Drilled	12	300	80.0	------	------	------	None	------	------	None	----
114	N. A. Graffin	14	5	3	------	Dug	------	92	80.0	Mar. 3, '17	2,916.0	2,836.0	Cylinder	------	------	Gasoline engine	----
115	S. Miller	14	5	3	------	Dug	------	------	87.3	Mar. 3, '17	2,926.0	2,838.7	Cylinder	------	------	Windmill	----
116	E. D. S. Pope	14	5	3	1913	Drilled	12	160	78.3	April 4, '17	2,913.0	2,834.7	None	------	------	None	----
117	—— Hatch	14	5	3	------	Dug	------	------	Dry	------	2,906.6	------	None	------	------	None	----
118	M. E. Gibson	20	5	3	------	Dug	------	138	------	------	------	------	Cylinder	------	------	Windmill	----
119	M. W. Minor	20	5	3	------	Dug	------	147	Dry	------	------	------	Cylinder	------	------	None	----
120	A. E. Dennis	18	5	3	------	Drilled	12	184	125.8	Feb. 27, '17	2,929.4	2,803.6	None	------	------	None	----
121	—— Cochran	18	5	3	------	Dug	------	144	143.0	Feb. 27, '17	2,933.5	2,790.5	Cylinder	------	------	Windmill	----
122	—— Cochran	18	5	3	------	Dug	------	142	138.0	Feb. 27, '17	2,933.5	2,795.5	None	------	------	None	----
123	J. D. Humiston	18	5	3	1913	Drilled	14	464	97.0	Feb. 27, '17	2,908.0	2,811.0	Deep well	2	------	None	----
124	J. M. Raphael	18	5	3	------	Dug	------	------	------	------	2,925.0	------	None	------	------	None	----
125	Robert Cook	8	5	3	------	Dug	------	------	------	------	------	------	Cylinder	------	------	Windmill	----
126	Robert Cook	8	5	3	------	Drilled	------	170	106.0	------	2,918.0	2,812.0	None	------	------	None	----
127	Robert Cook	8	5	3	------	Drilled	10	125	109.2	------	2,925.0	2,815.8	Cylinder	------	------	Gasoline engine	10
128	C. E. Van Horn	22	5	3	------	Drilled	12	185	107.7	Feb. 28, '17	2,941.5	2,833.8	Cylinder	------	------	Windmill	----
129	M. M. White	8	5	3	------	Dug	------	90	88.0	Mar. 5, '17	------	------	Cylinder	------	------	Windmill	----
130	J. J. Hill	8	5	3	------	Dug	------	------	72.0	------	2,950.9	2,878.9	None	------	------	None	----
131	F. A. Fletcher	9	5	3	------	Drilled	------	458	89.1	Mar. 5, '17	2,910.0	2,820.9	Centrifugal	------	------	Gasoline engine	----
132	F. A. Fletcher	9	5	3	------	Drilled	7	213	77.4	Feb. 28, '17	2.905.5	2,828.1	None	------	2	None	----
133	O. S. Overholt	16	5	3	1902	Dug	------	85	77.5	------	2,905.5	2,828.0	Deep well	------	------	Gasoline engine	2
134	J. W. Kyle	16	5	3	1915	Drilled	12	218	72.0	------	2,903.6	2,831.6	Screw	------	15	Gasoline engine	18
135	J. F. Fitzsimmons	16	5	3	------	Dug	------	80	77.6	Mar. 5, '17	------	------	None	------	------	None	----
136	E. D. Mitchell	12	5	2	------	Drilled	------	------	126.0	Mar. 4, '17	2,965.9	2,839.9	None	------	------	None	----
137	W. H. Bronson	18	5	2	------	Dug	------	------	132.0	------	------	------	None	------	------	None	----
138	C. M. Abbeys	12	5	3	------	Dug	------	127	------	------	2,947.3	------	None	------	------	None	----
139	M. Liebold	12	5	3	------	Dug	------	------	------	------	2,950.9	------	None	------	------	None	----
140	E. H. Keller	2	5	3	------	Dug	------	------	116.7	Mar. 4, '17	------	------	None	------	------	None	----
141	J. S. Nation	2	5	3	------	Drilled	6	------	108.0	------	------	------	None	------	------	None	----
142	G. Green	2	5	3	------	Dug	------	165	157.6	Mar. 4, '17	------	------	Cylinder	------	------	Gasoline engine	----
143	G. B. Holbrook	4	5	3	------	Dug	------	97	72.8	Mar. 5, '17	------	------	Cylinder	------	------	Windmill	----
144	G. B. Holbrook	4	5	3	1909	Drilled	7	94	80.0	------	------	------	Cylinder	------	------	Windmill	----
145	E. H. Corwin	34	6	3	1910	Dug	------	110	101.2	Mar. 4, '17	------	------	Cylinder	------	------	Windmill	----
146	Byron Buneman	28	6	3	1915	Drilled	12	193	117.0	------	------	------	Single dp. w.	------	3	Gasoline engine	18
147	Byron Buneman	28	6	3	1915	Drilled	12	190	120.6	Mar. 4, '17	------	------	Screw	6	------	Gasoline engine	35

TABLE OF DATA ON WELLS AND PUMPING PLANTS IN VICTOR VALLEY—Continued.

Number	Owner	Location			Well						Elevations		Pump			Power	
		Section	Township	Range	Year made	Class	Size, inches	Depth, feet	Depth to water feet	Date measured	Ground, feet	Water, feet	Kind	Size, inches	Discharge claimed, mi. in.	Kind	Horsepower
148	G. A. Ground	7	5	3	1917	Dug		133	130.0				None			None	
149	A. B. Edmonds	6	5	3		Dug							None			None	
150	A. B. Sheridan	5	4	2	1915	Drilled	12	311	221.0		3,100.0	2,879.0	None			None	
151	John McDonald	8	4	2	1915	Drilled		418	255.0				None			None	
152	A. L. Martin	5	4	2		Drilled	12	280	187.0		3,041.0	2,854.0	Screw	7	60	Gasoline engine	90
153	E. O. Vessey	4	4	2	1915	Drilled	12	450	177.0	Mar. 1, '17	3,027.0	2,850.0	Air lift		60	Gasoline engine	60
154	E. Beasley	32	5	2		Drilled	12	307	170.0	Mar. 3, '17	3,025.7	2,855.7	None			None	
155	J. B. Davis	32	5	2		Drilled	10	200	160.7	Mar. 3, '17	3,011.5	2,850.8	Cylinder			Windmill	
156	E. R. Wheatley	4	4	2		Drilled	7	195	168.0		3,024.9	2,856.9	Cylinder			Windmill	
157	E. R. Wheatley	4	4	2	1917	Drilled					3,036.0		None			None	
158	D. W. Hurlihy	4	4	2	1915	Drilled	12	500	222.9	Mar. 1, '17	3,075.6	2,852.7	Air lift		40	Gasoline engine	
159	D. W. Hurlihy	10	4	2	1915	Drilled	12	550	220.3	Mar. 1, '17	3,073.2	2,852.9	Air lift		40	Gasoline engine	
160	J. W. Beasley	10	4	2	1915	Drilled	12	501	183.7	Mar. 1, '17	3,058.2	2,874.5	Air lift			Gasoline engine	
161	F. Liebold	14	4	2		Dug		147	144.2	Mar. 2, '17			Cylinder			Windmill	
162	W. S. Cherry	12	4	2		Drilled	12	270	63.0				Double dp. w.			Gasoline engine	25
163	W. S. Cherry	12	4	2		Drilled	12	70	62.0				Cylinder			Windmill	
164	John McPherson	1	4	2		Dug		24	19.0				Cylinder			Windmill	
165	—— Lockhart	6	4	1		Dug							None			None	
166	—— Lockhart	6	4	1		Dug		30	24.3	Mar. 2, '17			Centrifugal			Gasoline engine	
167	—— Lockhart	6	4	1		Dug		30	26.4	Mar. 2, '17			Cylinder			Windmill	
168	C. P. Summers	5	4	1		Dug		26	23.4	Mar. 2, '17			Cylinder			Windmill	
169	C. P. Summers	5	4	1		Dug		26	23.4	Mar. 2, '17			Cylinder			Windmill	
170	F. H. Hunt	35	4	5	1913	Drilled	12	816	750.0		3,613.9	2,863.9	Cylinder			None	
171	S. Zacsek	15	4	6	1912	Drilled	12	909	869.5		3,800.0	2,930.5	Cylinder	3x4	1	Gasoline engine	14
172	L. J. Hampton	22	4	5	1914	Drilled	12	802	650.0		3,551.9	2,901.9	Deep well	5	5	Gasoline engine	15
173	F. W. Lang	35	5	6		Drilled	12	598	505.3	April 6, '17	3,405.9	2,900.6	None			None	
174	Verde Ranch	5	4	5		Drilled	12	644	510.0	April 11, '18	3,390.0	2,880.0	None			None	
175	F. C. Lang	22	5	6	1914	Drilled	12	536	330.0		3,254.5	2,924.5	Double dp. w.	7	33	Gasoline engine	40
176	Julia Lang	22	5	6		Drilled	12	475	328.5	April 6, '17	3,250.1	2,921.6	None			None	
177	Secord & Black	12	4	5	1914	Drilled	12	572	490.0	April 12, '18	3,351.5	2,861.5	Cylinder			None	
178	Appleton L. W. & P. Co.	21	5	4		Drilled	8	753	342.0		3,200.0	2,858.0	None			None	
179	W. W. Yeager	18	5	5	1915	Dug		305	298.6	April 6, '17	3,142.8	2,844.2	None			None	

180	C. R. Smyth	15	5	5	1902	Drilled	8	323	292.5	April 6, '17	3,090.3	2,817.8	Cylinder	------	------	Windmill	----
181	S. V. Benson	20	5	5	------	Drilled	7	365	323.0	Mar. 8, '17	3,165.3	2,842.3	None	------	------	None	----
182	Appleton L. W. & P. Co.	16	5	4	------	Drilled	14	861	29.0	Feb. 24, '17	2,848.3	2,819.3	Turbine	------	35	Gasoline engine	----
183	W. G. Doble	22	5	5	1912	Drilled	10	340	305.0	------	3,125.9	2,820.9	Double dp. w.	5x18	------	None	----
184	W. G. Doble	22	5	5	1903	Drilled	5	325	300.0	------	3,125.9	2,825.9	Single dp. w.	3¼x4x8	------	Gasoline engine	----
185	H. T. Woods	22	5	5	1908	Drilled	8	340	297.5	------	3,121.0	2,823.5	Double dp. w.	5x30	12	Gasoline engine	----
186	P. S. Carl	12	5	5	1909	Dug	------	------	143.1	Mar. 8, '17	2,938.3	2,794.2	None	------	------	None	----
187	A. M. Corder	12	5	5	------	Drilled	8	80	70.0	------	------	------	None	------	------	None	----
188	A. T. & S. F. R. R.	13	5	5	------	Drilled	8	300	70.0	------	2,967.1	2,897.1	None	------	------	None	----
189	C. H. Smith	2	5	5	1909	Dug	------	156	153.0	------	2,919.6	2,796.6	Cylinder	------	------	Windmill	----
190	C. H. Smith	2	5	5	1913	Dug	------	------	120.9	Mar. 8, '17	2,902.2	2,781.3	None	------	------	None	----
191	E. L. De Bolt	8	5	5	1912	Drilled	12	285	238.6	Mar. 8, '17	3,050.0	2,811.4	Deep well	------	------	Gasoline engine	12
192	L. W. De Bolt	12	5	6	1913	Dug	------	------	211.0	April 6, '17	3,065.0	2,854.0	Cylinder	------	------	Windmill	----
193	J. D. Caldwell	6	5	5	1912	Drilled	10	650	174.6	Mar. 8, '17	------	------	Deep well	------	25	Gasoline engine	16
194	J. Biescar	32	6	5	1912	Drilled	12	243	112.0	------	------	------	Double dp. w.	18	20	Gasoline engine	15
195	E. S. Fisk	34	6	5	------	Dug	------	------	150.0	Feb. 13, '18	2,925.0	2,775.0	Cylinder	------	3	Gasoline engine	----
196	J. M. Scott	34	6	5	------	Drilled	------	157	137.0	------	------	------	Cylinder	3	------	Gasoline engine	1
197	H. Martin	33	6	5	------	Drilled	------	------	------	------	------	------	Cylinder	5	------	Gasoline engine	----
198	J. L. Trummond	26	6	5	------	Drilled	6	500	153.2	April 5, '17	------	------	None	------	------	None	----
199	H. K. Hedges	14	6	5	------	Dug	------	------	119.0	Feb. 13, '18	2,841.1	2,722.1	Cylinder	5	------	None	----
200	H. K. Hedges	14	6	5	------	Dug	------	------	120.0	Feb. 13, '18	2,836.7	2,716.7	None	------	------	None	----
201	E. K. Isaacs	16	6	5	------	Drilled	12	158	102.0	Feb. 13, '18	2,838.3	2,736.3	Cylinder	5x20	12	Gasoline engine	15
202	E. H. Richardson	28	6	5	------	Drilled	12	595	113.0	Feb. 13, '18	2,879.5	2,766.5	Air lift	7¼x12	40	Gasoline engine	80
203	E. H. Richardson	28	6	5	1916	Drilled	14	------	124.3	April 5, '17	------	------	Air lift	7¼x12	40	Gasoline engine	80
204	E. H. Richardson	20	6	5	------	Drilled	12	------	88.0	Feb. 14, '18	2,857.6	2,769.6	Cylinder	------	------	Windmill	----
205	E. H. Richardson	20	6	5	------	Drilled	12	------	89.0	Feb. 14, '18	2,857.0	2,768.0	None	------	------	None	----
206	E. H. Richardson	20	6	5	------	Drilled	------	------	------	------	------	------	None	------	------	None	----
207	W. S. Lehman	27	6	5	------	Drilled	7	709	100.0	------	------	------	None	------	------	None	----
208	—— Campbell	8	6	5	------	Drilled	------	295	------	------	------	------	None	------	------	None	----
209	A. M. Steele	5	5	7	------	Drilled	6	390	232.0	------	3,155.1	2,923.1	Cylinder	------	------	Gasoline engine	----
210	O. W. Jessup	9	5	7	------	Drilled	8	350	280.0	------	3,211.1	2,931.1	Cylinder	------	------	Gasoline engine	3
211	T. O. Ford	4	5	7	------	Drilled	12	300	238.3	April 7, '17	3,157.4	2,919.1	Cylinder	4	------	Gasoline engine	6
212	G. S. Pownald	2	5	7	1913	Drilled	6	380	235.0	------	3,157.8	2,922.8	Cylinder	------	------	Windmill	----
213	De Meville-Rowley	12	5	7	------	Drilled	12	415	315.0	------	------	------	None	------	------	None	----
214	W. Sly	6	5	6	1911	Drilled	12	------	251.0	Feb. 19, '18	3,149.3	2,898.3	None	------	------	None	----
215	G. W. Phenice	31	6	7	1915	Drilled	12	410	153.4	April 7, '17	------	------	None	------	------	None	----
216	Paul Showers	30	6	7	1915	Drilled	12	295	80.0	------	------	------	Deep well	------	------	Gasoline engine	1½
217	H. M. Engebritson	27	6	7	1915	Dug	------	150	135.0	------	------	------	Deep well	------	1	Gasoline engine	3
218	W. Campbell	27	6	7	1916	Drilled	12	400	125.0	------	------	------	Centrifugal	3	25	Gasoline engine	6
219	C. B. Hawks	21	6	7	------	Dug	------	97	------	------	------	------	Deep well	------	1	Gasoline engine	3
220	J. R. Palmer	22	6	7	1912	Drilled	12	330	76.0	------	------	------	None	------	------	None	----
221	C. Williams	22	6	7		Drilled	12	425	73.0	April 6, '17	------	------	Air lift	------	13	Gasoline engine	35

TABLE OF DATA ON WELLS AND PUMPING PLANTS IN VICTOR VALLEY—Continued.

Number	Owner	Location			Well						Elevations		Pump			Power	
		Section	Township	Range	Year made	Class	Size, inches	Depth, feet	Depth to water feet	Date measured	Ground, feet	Water, feet	Kind	Size, inches	Discharge claimed, mi. in.	Kind	Horsepower
222	D. Anderson	24	6	7		Dug		61	57.0	Feb. 21, '18	2,922.0	2,865.0	None			None	
223	H. Braden	24	6	7		Drilled			88.6	Mar. 7, '17			None			None	
224	C. H. Sampson	30	6	6	1915	Drilled	12	250	133.2	Mar. 7, '17			None			None	
225	C. H. Sampson	30	6	6	1911	Drilled	12	136	133.2	Mar. 7, '17			None			None	
226	F. Reinke	32	6	6	1910	Drilled	12	380	131.0	Feb. 20, '18	3,047.8	2,916.8	None			None	
227	J. W. Walker	28	6	6		Drilled	12	136	102.0		2,948.3	2,846.3	Cylinder			Gasoline engine	
228	L. M. Cotton	28	6	6	1915	Drilled	12	150	105.0	Feb. 20, '18	2,948.9	2,843.9	Deep well			Gasoline engine	3
229	W. B. Phillips	18	6	6	1911	Drilled	12	76	45.0				None			None	
230	F. P. Williams	18	6	6		Drilled	12		48.9	April 7, '17			None			None	
231	F. P. Williams	18	6	6		Drilled	12	205	32.0				Deep well			Gasoline engine	4
232	R. Atz	14	6	7	1912	Dug							Cylinder			Gasoline engine	3
233	Ed White	15	6	7		Drilled	8	58	49.0				Deep well			Gasoline engine	3
234	W. Huston	20	6	7		Dug		67	65.3	April 7, '17			None			None	
235	Etta McKelvey	17	6	7	1916	Drilled	12	300	73.5	April 7, '17			None			None	
236	W. J. Shaw	18	6	7		Dug			55.5	Feb. 17, '18	2,920.8	2,865.3	None			None	
237	E. Bonino	18	6	7		Dug			50.0	Feb. 17, '18	2,897.8	2,847.8	None			None	
238	W. E. Anderson	18	6	7		Dug			52.0				None			None	
239	F. A. Forsyth	7	6	7	1914	Drilled	8	50	37.5	Feb. 16, '18	2,870.4	2,832.9	None			None	
240	J. Dobersch	7	6	7		Drilled	12						None			None	
241	G. B. Flock	8	6	7		Drilled	8	42	37.0				None			None	
242	I. S. Lindley	9	6	7	1914	Drilled	8						None			None	
243	E. F. Anger	10	6	7		Dug		140	24.0		2,857.1	2,818.1	Cylinder			Gasoline engine	
244	J. Seward	11	6	7		Dug			23.2		2,869.0	2,845.8	Deep well			Gasoline engine	
245	E. J. Krause	11	6	7	1916	Drilled	12	210	21.0	Feb. 21, '18	2,849.2	2,828.2	Centrifugal		42	Gasoline engine	8
246	K. McDonald	11	6	7		Dug		25	21.5	Feb. 21, '18	2,853.9	2,832.4	None			None	
247	Grace E. Davis	2	6	7	1916	Drilled	14	226	20.5	Feb. 21, '18	2,841.1	2,820.6	Centrifugal	5	45	Gasoline engine	15
248	W. M. Gray	3	6	7	1912	Drilled	12	392	16.0				None			None	
249	W. M. Gray	3	6	7		Drilled	12	367	23.1	Mar. 7, '17			None			None	
250	T. R. Croswell	4	6	7	1912	Drilled	12	183	27.0				Deep well		15	Gasoline engine	15
251	T. R. Croswell	9	6	7		Dug		26	26.0				None			None	
252	Marian B. Charles	5	6	7	1912	Drilled	7	157	25.0				Centrifugal	2½	18	Gasoline engine	15
253	Marian B. Charles	5	6	7	1917	Dug		41	36.0	Feb. 16, '18	2,853.3	2,817.3	Cylinder	6x8	4	Gasoline engine	6

254	W. H. Anderson	5	6	7	1916	Drilled	8	58	22.0	----	----	----	Centrifugal	½	15	Gasoline engine	10
255	S. P. R. R.	7	6	6	1890	Dug	----	24	23.0	Feb. 14, '18	2,838.2	2,815.2	None	----	----	None	----
256	L. C. Wheeler	35	7	7	----	Dug	----	----	42.0	Feb. 14, '18	2,859.3	2,717.3	Centrifugal	----	----	Gasoline engine	5
257	C. W. Brockman	32	7	7	1915	Drilled	12	80	27.0	Feb. 16, '18	2,843.3	2,816.3	None	----	----	None	----
258	L. L. Whitlock	28	7	7	----	Drilled	7	93	31.0	Feb. 16, '18	2,848.0	2,817.0	Centrifugal	4	----	Gasoline engine	15
259	C. Munsey	22	7	7	1913	Drilled	7	118	78.0	----	----	----	Cylinder	----	----	Windmill	----
260	L. Hess	27	7	7	1917	Drilled	10	125	46.0	Feb. 16, '18	2,862.9	2,816.9	Centrifugal	6	75	Gasoline engine	----
261	J. Young	8	7	7	----	Dug	----	100	95.0	----	----	----	None	----	----	None	----
262	F. Busch	10	5	4	1917	Dug	----	----	8.0	----	2,719.6	2,711.6	Centrifugal	3	----	Gasoline engine	6
263	G. Smith	10	5	4	----	Drilled	14	59	3.0	----	2,714.0	2,711.0	Centrifugal	6	----	Electric	10
264	E. Doulch	10	5	4	----	Drilled	14	39	10.5	----	2,715.8	2,705.3	None	----	----	None	----
265	S. Rogers	3	5	4	----	Drilled	----	----	14.6	----	2,708.6	2,694.0	Cylinder	----	----	Windmill	----
266	C. Bassini	34	6	4	----	Drilled	14	75	----	----	2,696.4	----	Centrifugal	4	70	Gasoline engine	18
267	C. Bassini	34	6	4	----	Drilled	12	107	87.0	----	2,758.4	2,671.4	Deep well	5x18	30	Gasoline engine	5
268	—— Hadley	34	6	4	----	Drilled	----	----	56.3	Feb. 16, '17	----	----	None	----	----	None	----
269	—— ——	10	5	4	----	Dug	----	----	48.2	----	2,770.9	2,722.7	None	----	----	None	----
270	—— ——	5	5	5	----	Dug	----	----	----	----	2,780.7	----	None	----	----	None	----
271	—— ——	32	6	4	----	Dug	----	----	3.0	----	2,737.3	2,734.3	None	----	----	None	----
272	—— ——	32	6	4	----	Dug	----	----	9.1	----	2,721.4	2,712.3	None	----	----	None	----
273	Victor Cement Co.	18	6	4	1909	Drilled	12	260	----	----	----	----	Centrifugal	3	----	Electric	15
274	Victor Cement Co.	18	6	4	1916	Drilled	16	125	----	----	----	----	Centrifugal	8	180	Electric	30
275	Victor Cement Co.	18	6	4	1916	Drilled	16	270	----	----	----	----	Centrifugal	8	180	Electric	30
276	W. Watkins	30	7	4	1914	Drilled	12	202	54.0	----	----	----	Double dp. w.	8	15	Gasoline engine	12
277	W. Watkins	30	7	4	1914	Drilled	12	100	15.0	----	----	----	Centrifugal	4	----	Gasoline engine	10
278	O. A. Poole	19	7	4	1916	Drilled	12	225	30.6	April 8, '17	----	----	Centrifugal	8	12	Gasoline engine	32
279	A. Edwards	26	7	5	----	Dug	----	----	171.0	Feb. 18, '18	2,737.0	2,566.0	None	----	----	None	----
280	J. M. Peden	27	7	5	----	Dug	----	----	----	----	----	----	None	----	----	None	----
281	—— Kirkpatrick	27	7	5	----	Dug	----	----	----	----	----	----	None	----	----	None	----
282	W. Warren	27	7	5	----	Dug	----	----	81.0	Feb. 18, '17	2,718.3	2,637.3	None	----	----	None	----
283	—— Gwyne	15	7	5	----	Drilled	12	235	----	----	----	----	None	----	----	None	----
284	Y. M. C. A.	31	7	5	1914	Drilled	12	230	----	----	----	----	None	----	----	None	----
285	—— Mallman	2	6	5	1915	Drilled	12	235	208.0	Feb. 18, '18	2,786.0	2,578.0	None	----	----	None	----
286	L. P. Burgmeir	26	7	5	----	Dug	----	----	105.0	Feb. 18, '18	2,724.0	2,619.0	None	----	----	None	----
287	—— ——	2	6	5	----	Dug	----	----	204.0	Feb. 18, '18	2,780.0	2,576.0	Cylinder	----	----	Windmill	----
288	—— ——	10	6	5	----	Dug	----	----	108.0	Feb. 18, '18	2,807.0	2,699.0	None	----	----	None	----
289	E. H. Richardson	28	6	5	1917	Drilled	12	----	----	----	2,878.0	----	None	----	----	None	----
290	E. H. Richardson	28	6	5	1917	Drilled	8	350	133.0	Feb. 14, '18	2,878.0	2,745.0	None	----	----	None	----
291	—— ——	14	6	5	----	Dug	----	----	113.5	Feb. 18, '18	2,823.0	2,709.5	None	----	----	None	----
292	B. S. Hook	14	6	6	----	Dug	----	----	42.5	Feb. 20, '18	2,833.0	2,790.8	Centrifugal	----	----	Gasoline engine	----
293	W. J. Jensen	35	7	7	----	Drilled	12	203	36.0	Feb. 14, '18	2,853.0	2,817.0	None	----	----	None	----
294	B. M. Elsey	26	7	7	----	Dug	----	44	42.0	Feb. 14, '18	2,857.0	2,815.0	None	----	----	Gasoline engine	----

TABLE OF DATA ON WELLS AND PUMPING PLANTS IN VICTOR VALLEY—Continued.

Number	Owner	Location			Well						Elevations		Pump			Power	
		Section	Township	Range	Year made	Class	Size, inches	Depth, feet	Depth to water feet	Date measured	Ground, feet	Water, feet	Kind	Size, inches	Discharge claimed, mi. in.	Kind	Horsepower
295	—— Gilbert	26	7	7	1917	Dug			74.0	Feb. 14, '18	2,891.0	2,817.0	None			None	
296	L. B. Coleman	6	5	7		Drilled	10		199.0	Feb. 17, '18	3,109.0	2,910.0	None			None	
297	John Breen	35	7	7		Dug		25	20.0	Feb. 21, '18	2,837.5	2,817.5	None			None	
298	—— ——	2	6	7		Dug			17.0	Feb. 21, '18	2,835.7	2,817.7	None			None	
299	El Mirage School	3	6	7		Dug			22.0	Feb. 21, '18	2,842.8	2,820.8	None			None	
300	—— ——	12	6	7		Dug			21.0	Feb. 21, '18	2,867.0	2,846.0	Cylinder			Windmill	
301	F. L. Thomas	18	4	5		Drilled	7	330	Dry				None			None	
302	W. H. Robinson	6	6	4		Dug		41	35.0				Cylinder			Windmill	
303	E. B. Rowley	19	7	4		Drilled		270	60.0				Centrifugal		100	Gasoline engine	60
304	E. B. Rowley	19	7	4		Dug		110	92.0				None			None	
305	P. Herlick	7	7	4		Dug		40	34.0				None			None	
306	F. C. Abbott	18	7	4		Drilled		270	55.0				Centrifugal		105	Gasoline engine	40
307	C. A. Garbutt	21	6	5		Dug			170.0				None			None	
308	A. H. Diamond	26	6	5		Dug			120.0				None			None	
309	H. C. Jones	19	6	5		Dug		87	75.0				None			None	
310	J. C. White	30	6	5		Dug			96.0				None			None	
311	Olive A. Stone	30	6	5		Dug			100.0				None			None	
312	W. L. Norris	20	6	6		Drilled	12		130.0				None			None	
313	—— ——	27	6	6		Drilled	12		128.0				None			None	
314	R. R. Jamison	18	6	6		Dug		58	56.0				None			None	
315	R. R. Jamison	14	6	6		Dug		50	43.0				None			None	
316	—— ——	14	6	6		Dug		54	40.0				Cylinder			Windmill	
317	W. W. McKinney	30	6	7		Dug		159	139.0				None			None	
318	G. Penaul	2	5	6		Dug			236.0				None			None	
319	T. A. De Bolt	12	5	6		Dug			150.0				None			None	
320	D. S. Ball	12	5	6		Drilled		423	300.0				None			None	
321	P. Weile	18	5	5		Drilled		365	313.0				None			None	
322	S. I. Pickert	34	5	5		Drilled		578	570.0				None			None	
323	—— ——	24	5	5		Drilled			240.0				None			None	
324	—— ——	1	5	5		Dug			119.0				None			None	
325	A. T. & S. F. R. R.	10	5	4		Drilled		200	10.0				Centrifugal			Electric	

326	L. Harris	34	5	3		Drilled		344	187.0				None			None	
327	R. W. Miller	15	4	3		Drilled		195	145.0				None			None	
328	E. D. Vessey	4	4	2		Dug			160.0				Cylinder			Windmill	
329	F. H. Nett	19	5	2		Dug			98.0				None			None	
330	—— Hitchcock	19	5	2		Dug			100.0				None			None	
331	W. C. Marston	27	7	3		Dug			130.0				Deep well		10	Gasoline engine	
332	A. J. Allen	28	6	2		Dug			123.0				None			None	
333	—— Jackson	33	6	2		Dug			160.0				None			None	

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OF THE

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A SUBDIVISION OF THE

Department of Engineering

OF THE

State of California

TO ACCOMPANY THE

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BIENNIAL REPORT OF THE CALIFORNIA HIGHWAY COMMISSION.

December 31, 1918.

INTRODUCTORY.

In 1910 the people of the state of California adopted the "State Highways Act" providing for the issuance of bonds to the amount of $18,000,000 for the construction and acquisition of a system of state highways.

It was the mandate of the act that such system should be constructed and acquired by the State Department of Engineering.

The Department of Engineering as then constituted consisted of an advisory board composed of the Governor as ex officio member and chairman, the State Engineer, the general superintendent of state hospitals and the chairman of the State Board of Harbor Commissioners of San Francisco.

The functions of this board were advisory in their nature as obviously their members were engrossed with the regular duties of their respective offices.

In 1911 the legislature passed what is commonly known as the Chandler Act, which added three more members of the Department of Engineering designated as the three appointed members.

While the Chandler Act did not specifically so declare, yet it was tacitly understood at the time of its passage that the three appointed members were to be chosen primarily for the purpose of actively carrying out the eighteen-million-dollar highway trust, and when appointed were named with their qualifications as such trustees in view.

Messrs. Charles D. Blaney of Saratoga, Burton A. Towne of Lodi, and Newell D. Darlington of Los Angeles, were in 1911 appointed by Governor Hiram W. Johnson to be the three appointed members. At a meeting of the advisory board, held in August, 1911, an enabling resolution designating Messrs. Blaney, Towne and Darlington the three appointed members as an executive committee to be known as the California Highway Commission and vesting in such committee the actual handling of the work of constructing and acquiring the state highway system under the bond issue of 1910, was adopted.

The California Highway Commission thereupon organized and Burton A. Towne was chosen to be the first chairman.

A. B. Fletcher, appointed by Governor Johnson as Highway Engineer of California, became the executive officer of the commission, Wilson R Ellis, the secretary, and C. C. Carleton, the attorney.

In the fall of 1911 the members of the commission, with the Highway Engineer, made a comprehensive tour of the state in order to obtain first-hand impressions of the routes to be followed and the needs of the people of the respective communities.

In December, 1911, the commission determined to establish seven division offices in different parts of the state, each in charge of a division engineer, and the following appointments of division engineers were made and branch offices established: Francis G. Somner, Willits; T. A. Bedford, Redding; Wm. S. Caruthers, Sacramento; Arthur E. Loder, San Francisco; Walter C. Howe, San Luis Obispo; J. B. Woodson, Fresno, and W. Lewis Clark, Los Angeles.

The Redding office has since been moved to Dunsmuir.

There have been several changes on the staff of division engineers. Mr. Clark has succeeded Mr. Loder as division engineer at San Francisco; W. W. Patch has succeeded Mr. Clark as division engineer at Los Angeles; and Lester H. Gibson has succeeded Mr. Howe as division engineer at San Luis Obispo.

George R. Winslow, in January, 1912, became the commission's office engineer and later, First Assistant Highway Engineer.

After the preliminary organization had been completed, actual road building operations were commenced in the summer of 1912.

The legislature of 1913 passed California's first comprehensive act for the registration of motor vehicles and the licensing of operators thereof.

This act provided that one-half of the net proceeds should be devoted to the maintenance of state roads and highways.

After this act had become effective, the advisory board imposed upon the California Highway Commission the further duty of maintaining the state highways constructed under the "State Highways Act."

In the year 1916 the people adopted the "State Highways Act of 1915" for a second state highway bond issue, in amount $15,000,000 and the expenditure of the proceeds thereof was placed in charge of the California Highway Commission.

Finally the legislature of 1917 gave the California Highway Commission statutory recognition and a legal entity by an amendment of the Department of Engineering law providing that the three appointed members of the advisory board shall compose a subdivision of the Department of Engineering designated as the California Highway Commission and expressly prescribing their powers and duties.

This amendatory act also transferred all state roads which had been constructed under special appropriations and which until 1917 had remained in charge of the State Engineer to the jurisdiction of the California Highway Commission.

Thus the California Highway Commission ceased to be an executive committee of the advisory board created for greater convenience in the conduct of the state highway work under the bond issues and has become a statutory body in immediate control and supervision of all state road and highway activities of California.

In 1914, Mr. Towne resigned as a member of the advisory board and California Highway Commission and was succeeded by Charles F. Stern of Eureka. In 1917, Mr. Blaney, who had served as chairman of the commission after the resignation of Mr. Towne, resigned and was succeeded by Henry J. Widenmann of Vallejo. In October, 1918, after the death of Mr. Widenmann, Charles A. Whitmore of Visalia was appointed to succeed him, and in the same year, Emmett Phillips of Sacramento succeeded Mr. Stern, resigned.

The present California Highway Commission therefore is composed of Messrs. Darlington, Whitmore and Phillips. Mr. Darlington being the present chairman.

The organization chart on page 8 shows graphically how the different departments of the commission function.

THE TWO BOND ISSUES.

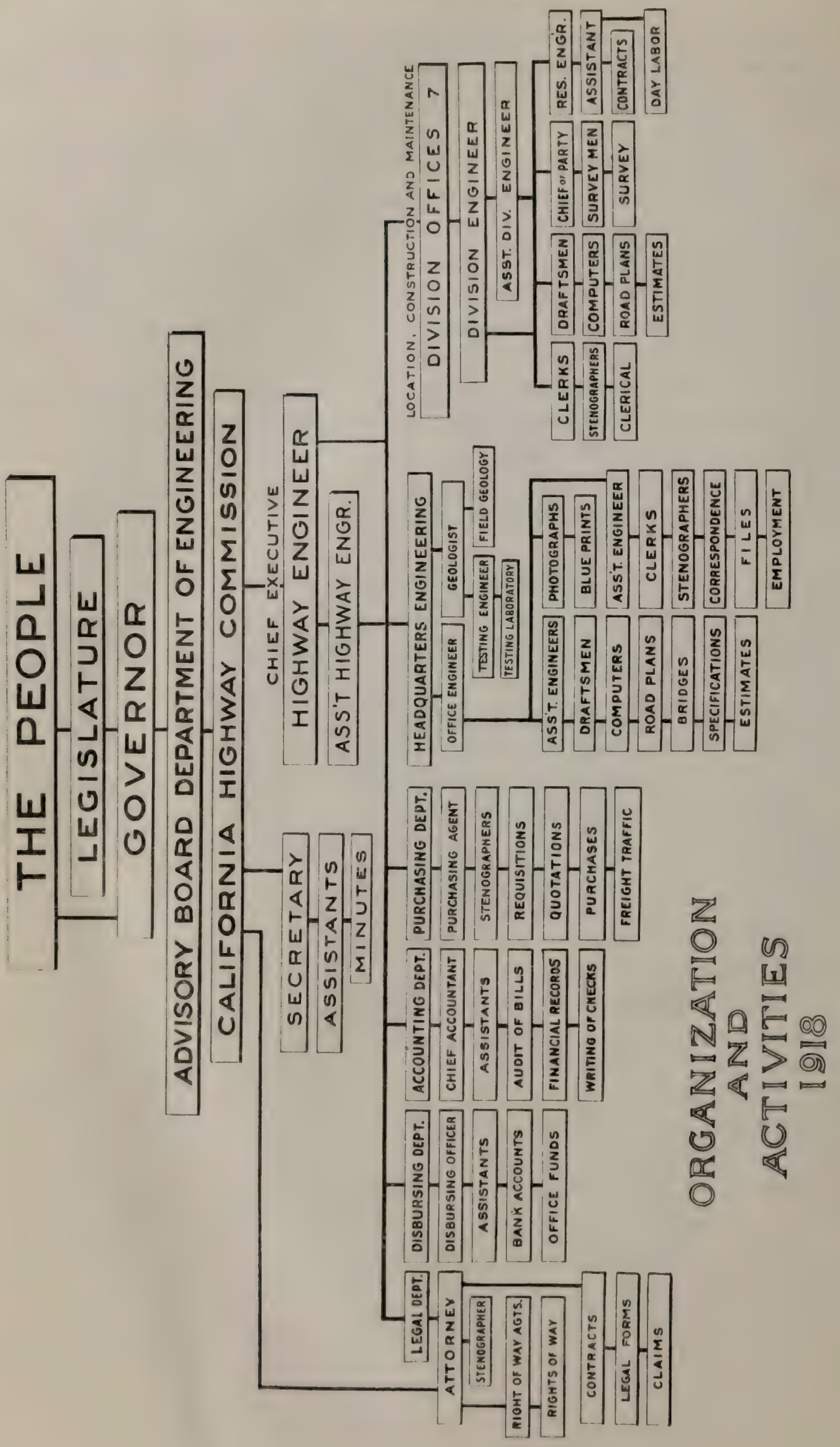
In 1910 California passed its first state highways act providing for a bond issue of eighteen million dollars to build a specific trunk line system of highways. This act was passed by a bare majority of the people of the state, being defeated in southern California by an aggregate vote of three to one. In 1916 the second highways act was passed providing for a bond issue of fifteen million dollars. This act was approved by a majority of the people in every county in California and by an aggregate vote of nearly four to one. (See table in Appendix "O" showing the votes by counties on these bond issues.)

The original eighteen millions were exhausted by January, 1917. The funds from the new bond issue could not be available under the act until after the beginning of the new fiscal year, July, 1917.

At a conference in January, 1917, participated in by all of the state officials concerned, a unanimous decision was reached that the highway work should proceed during the interim, that its cost would be defrayed by borrowing from the Motor Vehicle Fund, and that the state, itself, would guarantee the sale of not less than three millions of highway bonds when their advertisement and sale should be legal under the act.

The first block of five million of the new bonds was sold in August, 1917, at a slight premium. Had the law permitted the state to market these bonds in January rather than in August, they would have commanded a much greater premium.

It is to be recommended that in future issues of this description, restrictions be removed as to date of sale.



ORGANIZATION
AND
ACTIVITIES
1918

The first bond issue of $18,000,000, bearing 4 per cent interest, was hard to market and of the total but $4,280,000 were sold publicly. The remainder, $13,720,000, was sold to the counties which purchased them because otherwise the work could not have gone on. The following table shows the disposition of the bonds:

SALES HIGHWAY BONDS TO COUNTIES.

Division I.		
Humboldt	$600,000	
Mendocino	445,000	$1,045,000
Division II.		
Shasta	$205,000	
Siskiyou	225,000	
Tehama	350,000	
Trinity	15,000	$795,000
Division III.		
Butte	$325,000	
Colusa	486,000	
El Dorado	150,000	
Glenn	268,000	
Placer	250,000	
Solano	350,000	
Stanislaus	210,000	
Sutter	105,000	
Tuolumne	100,000	
Yolo	50,000	
Yolo–Sacramento	627,000	
Yuba	40,000	$2,961,000
Division IV.		
Alameda	$400,000	
Contra Costa	300,000	
Marin	150,000	
Napa	125,000	
Santa Clara	638,000	
Santa Cruz	135,000	
San Mateo	325,000	
Sonoma	220,000	$2,293,000
Division V.		
Monterey	$580,000	
San Benito	125,000	
Santa Barbara	694,074	
San Luis Obispo	385,000	$1,784,074
Division VI.		
Fresno	$150,000	
Inyo	100,000	
Kern	640,000	
Kings	105,000	
Mariposa		
Merced	220,000	
Mono	50,000	
Tulare	265,000	$1,530,000
Division VII.		
Imperial	$380,000	
Orange	400,000	
Los Angeles	1,195,000	
Riverside	100,000	
San Bernardino	193,000	
San Diego	522,000	
Ventura	521,926	$3,311,926
Total	$13,720,000	
General	4,280,000	$18,000,000

The second issue of $15,000,000 bearing interest at 4½ per cent seemed to find a ready market except when the Federal Capital Issues Committee was in operation. Of this issue, bonds have been sold as follows:

Date	Purchaser	Numbers	Amount
Aug. 1, 1917	National City Co. and E. H. Rollins & Son	1–3000	$3,000,000 00
Sept. 11, 1917	Teachers' Permanent Fund	3001–3250	250,000 00
Sept. 8, 1917	National City Co.	3251–5000	1,750,000 00
May 8, 1918	National Bank of D. O. Mills & Co.	5001–5005	5,000 00
June 22, 1918	National Bank of D. O. Mills & Co.	5006–5011	6,000 00
Aug. 5, 1918	General Fund surplus	5012–5311	300,000 00
Aug. 9, 1918	H. J. Aden	5312–5316	5,000 00
Aug. 28, 1918	General Fund surplus	5317–5516	200,000 00
Oct. 29, 1918	General Fund surplus	5517–5841	325,000 00
Nov. 26, 1918	General Fund surplus	5842–6041	200,000 00
Nov. 30, 1918	General Fund surplus	6042–6641	600,000 00
Nov. 30, 1918	Anglo-London-Paris National Bank	6642–7116	475,000 00
	Total		$7,116,000 00

Of the total bond issue of $15,000,000 but $7,884,000 remains to be sold. Of this amount $3,000,000 must be reserved for work to be done under the provisions of the law relating to the "$3,000,000 Lateral Roads" discussed on page 25, and it is probable that obligations already incurred will require at least $2,750,000 for their fulfillment so that but little more than $2,000,000 remains for new work.

Statements of financial conditions and expenditures will be found in Appendix "C".

HOW WAR AFFECTED WORK.

In April, 1917, the United States entered the war. Conditions became increasingly abnormal; costs of labor, equipment, materials and subsistence steadily increased. Shortage of skilled labor and transportation developed. None the less, the work progressed to the utmost limit of the facilities available. During this year highway work east of the Rockies was almost entirely suspended—but California kept on.

By the fall of 1917 the war conditions developed conspicuously in California. A freight embargo was laid on the use of open cars for highway purposes by the War Industries Board. To meet this situation various transportation expedients were adopted; cement and materials were shipped in open cars or in box cars, were hauled by motor trucks and tractors, and the commission even leased and operated cars of a type exempt from the embargo.

As these conditions developed the work had gradually dragged. The state was delayed in the delivery of materials on contracts, due to lack of transportation. Contracts that should have been finished in 1917 remained for completion in 1918, either through the inability of the contractors to finish or due to their deliberate choice of reserving the work for possibly more favorable conditions in 1918.

The advancing wages paid to laborers had naturally a most serious effect on the unit prices bid by contractors on state highway contracts so that in 1917 and 1918 contracts were let frequently at unit costs from 40 to 60 per cent greater than were used in the preliminary estimates, made in 1914 and 1915, on which the second bond issue was based.

The engineers uniformly increased their estimates to keep up with the steadily advancing cost of labor and materials but it was a rare contract that was let within the engineer's estimate.

Some contract sections were advertised two and three times and no proposal within reason was received.

The years 1917 and 1918 were particularly difficult ones for the contractors engaged in state highway work. Contracts taken at a price based on labor at $2.50 to $3.00 per day have been completed with labor at $4.00 to $5.00 per day, and subsistence in proportion. This condition has resulted in a loss to a great many contractors and in great financial distress to a number.

The state's obligation in the premises is a matter for discussion. Certainly the state does not insure contractors' profits, but it is equally certain that the contractor, as an individual, ought not to be called upon to shoulder all the war burden.

Because of delays in furnishing materials to its contractors, due to causes beyond its control in most instances, the commission has sometimes approved contractors' claims for damages, the payment coming from the State Highway Fund. Again, to avoid such claims, in 1917 and 1918 the commission frequently paid a considerable part of the cost of stockpiling materials in advance of their use so that when needed there would be no shortage.

But the class of claim first referred to, due solely to advanced prices because of the war, and accruing after the execution of the contracts, the commission believes should be the subject of special consideration.

If such claims are to be paid, the general fund of the state and not the State Highways Fund should carry the burden.

UNITED STATES HIGHWAYS COUNCIL AND CAPITAL ISSUES COMMITTEE.

Complaints from the public were heard at times in 1918 of the slowness of progress in state highway construction. It is true that the work seemed to drag but it is also true that east of the Rocky Mountains there was practically no state highway construction whatever.

While the highway work in 1918 progressed under every character of difficulty, it did progress.

In the early weeks of the year the commission and its engineers carefully canvassed the situation, with a view to determining upon a construction program for 1918 that would comprise only the essential highway projects. Out of approximately 150 projects all but 31 were eliminated from consideration for the year 1918.

On March 13, 1918, this program was presented to the local committee of the Federal Reserve Bank, representing the National Capital Issues Committee. This committee was then without legal authority, but it was the desire of this department to co-operate, not only in letter but in spirit, with any federal agency. The proposed program was supported with maps, detailed descriptions of individual projects, complete financial statement, and with testimony obtained direct from the communities involved as to why their particular projects should be completed under war conditions. Every facility of this department was placed at the disposal of the Capital Issues Committee. Members of this commission, the highway engineer, and the chairman of the State Board of Control were in frequent conference with the local Capital Issues Committee through its chairman and its secretary; every particle of information and all data asked by the committee were promptly and cheerfully furnished. None the less, until September, 1918, no action was taken by this local committee, either granting or denying the request, either approving or disapproving the program, in whole or in part.

The construction period of 1918 was entered with a considerable number of contracts under way, carried over from 1917, with essential projects which should be undertaken during 1918, and no action, either favorable or unfavorable, from the Capital Issues Committee.

In the meantime, California communities were clamoring for their roads; there were ''missing links'' in the main trunk lines that should not be excluded under any possible definition of war necessity. These trunk lines were needed in complete form to relieve rail congestion and to facilitate the moving of agricultural products.

With a full sense of the responsibility involved, the commission carried on but made it perfectly plain that it was prepared to stop the work, in whole or in part, should the government so require. The Capital Issues Committee went out of existence to all practical purposes on December 31, 1918.

In August the United States Highways Council was organized, supposedly to clarify the muddled condition into which the highway work of the country had been placed by the conflicting actions and orders of the various national war boards.

The clarifying process, however, seemed to consist in an attempt to stop all highway construction regardless of local needs or facilities. The council seemed determined to make a uniform rule applicable throughout the country, and were it not for the armistice in November and the dissolution of the council within a day or two thereafter, it is probable that all highway work in California would have ceased.

This in spite of the facts that in this state labor could be had, costly and inefficient to be sure; that there was no shortage of road building materials; and that the freight car situation, though not good, was better in the fall months than in the previous year.

Fortunately, the commission proceeded with its work to the fullest extent possible, taking advantage of every condition available, and the armistice came before it was necessary to actually stop the work.

WORK DONE AND TO BE DONE.

The following tabulation shows the mileage of the several types of work accomplished in constructing the state highway system at the end of the fiscal year 1916, the accomplishment during the biennial period ending June 30, 1918, and the total mileage of each type on the latter date:

	June 30, 1916, miles	1916-1918 miles	Total June 30, 1918 miles
Cement concrete base with Topeka mixture or sheet asphalt tops	17.01	20.81	37.82
Cement concrete base with thin bituminous tops	766.76	241.43	[1]1,008.19
Broken stone base with Topeka mixture top	16.21		16.21
Oiled macadam	129.38	50.91	[2]180.29
Bituminous concrete	10.37	8.76	[2]19.13
Graded, but not paved	323.14	32.62	[3]355.76
Totals	1,262.87	354.53	[3]1,617.40

[1] On approximately 480 miles of this type, the thin bituminous top has not been applied.

[2] Includes 166 miles built by the counties, but now under the jurisdiction of the commission.

[3] This figure does not include nearly 700 miles of graded road taken over August 1, 1917, from the State Engineer's jurisdiction.

The figures in the foregoing table do not include unaccepted contracts incomplete on June 30, 1918, at which time the following mileages of road were under contracts let and in progress:

Cement concrete base with Topeka mixture tops	2.18 miles
Cement concrete base with thin bituminous tops	215.94 miles
Graded but not paved	131.25 miles
Total	349.37 miles

A very considerable portion of the 349 miles was completed by June 30, 1918, probably not less than 60 per cent.

On July 1, 1918, the gaps remaining in the original system (State Highways Act of 1910) are shown in the following table, but work under then existing contract or day labor authorizations is not included.

PORTIONS OF ORIGINAL SYSTEM UPON WHICH NO WORK HAS BEEN DONE.

County	Route	Section	Termini	Miles	Remarks
Sonoma	1	A	Healdsburg to Cloverdale	16	
Mendocino	1	B	Hopland to 2½ miles north	2.6	
Mendocino	1	G	Arnold to Sherwood-Laytonville Junction	10.4	
Humboldt	1	G	Fortuna to Loleta	3.9	
Humboldt	1	G	Beatrice to Eureka	7.9	
Humboldt	1	I, J, K	Arcata to north boundary	55.1	
Del Norte	1	A and B	South boundary to Crescent City	30	
Monterey	2	F	King City to King City Bridge	1.7	
Monterey	2	G	San Lucas to San Ardo	11.1	
Monterey	2	I	Three miles north of Bradley to south boundary	10.4	
Santa Barbara	2	A	Divide to Orcutt	3.6	
Butte	3	B	Biggs to Nelson	12.4	
Tehama	3	A	South boundary to Los Molinos	11.7	
Tehama	3	C	At north boundary	1	
Tehama	3	D	Los Molinos to Red Bluff	15.5	
Shasta	3	A	South boundary to Redding	15.6	
Siskiyou	3	A	South boundary to Dunsmuir	1.5	Improved county road to be taken over and alignment revised.
Siskiyou	3	B	Weed to Yreka	28.4	
Sacramento	4	A	Galt to south boundary	2	About 1.5 miles improved county road and about 3.8 new construction.
San Joaquin	4	D	North boundary to Houston School	5.3	New construction about 3 miles, improved county road 15.6.
San Joaquin	4	A and B	Stockton to south boundary	18.6	Improved county road.
Kern	4	D	One mile north of Bakersfield to Bakersfield	1	New construction on revised line.
San Joaquin	5	B	At French Camp and Banta	2.5	
Alameda	5	B	Castro Valley Road to Hayward	.5	
Alameda	5	C	Overacker to south boundary	8.4	
Sacramento	6	C	Sacramento River to end of pavement, West Sacramento	.5	
Yolo	7	B	Blacks to Woodland	11	
Los Angeles	9	B	La Canada to Pasadena	3.5	Improved county road.
San Diego	12	D	At Alpine	.9	
San Diego	12	E, F, G	Pine Valley to east boundary	35.7	
San Diego Imperial	12	H	Along San Diego-Imperial County boundary	2.8	
Imperial	12	A	West boundary to Myers Creek	5.1	
Stanislaus	13	B	Oakdale to Knights Ferry	11.6	
Mendocino	16	A	Hopland to east boundary	10.1	
Lake	16	A	West boundary to Lakeport	9.2	
Placer	17	A	Through Rocklin	1.5	
Placer	17	C	Auburn to north boundary	6.7	

Merced	18	A	Merced to east boundary	14.9	
Shasta	20	A and B	Redding to west boundary	26	
Trinity	20	A and B	East boundary to Weaverville	27	
Butte	21	A	Shippee Road to Oroville	6.7	
San Joaquin	24	B	Lodi to Clements	12.3	Improved county road.
San Joaquin	24	A	Clements to east boundary	4.3	
Calaveras	24	A	West boundary to Valley Springs	10	
Nevada	25	A	Nevada City to North San Juan	14	
Shasta	28	*A to E	Redding to Lassen County line	85	
Lassen	28	B	Bieber to north boundary	13	
Modoc	28	A and B	South boundary to Alturas	41	
Tehama	29	A, B, C	Red Bluff to east boundary	52.5	
Plumas	29	A	Tehama County line to Lassen County line	23	
Lassen	29	A	West boundary to Coppervale	10	
Lassen	29	B	Coppervale to Susanville	15	
Butte	30	A and B	Oroville to east boundary	35	
Plumas	30	A and B	West boundary to Quincy	30	
Sacramento	34	B	Arno to Clay	9.3	Under construction by county.
Sacramento	34	A	Clay to Amador County line	8.5	
Amador	34	A and B	Sacramento County line to Jackson	16.6	
			Total	829.8	

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*Inclusive.

Of the foregoing gaps, the following have been provided for since June 30, 1918:

County	Route	Section	Termini	Miles
Mendocino	1	G	Arnold to Sherwood-Laytonville Junction	10.4
Monterey	2	G	San Lucas to San Ardo	11.1
Monterey	2	I	Three miles north of Bradley to south boundary	10.4
Butte	3	B	Biggs to Nelson	12.4
Siskiyou	3	A	South boundary to Dunsmuir	1.5
San Joaquin	4	A and B	Stockton to sounth boundary	18.6
Alameda	5	C	Overacker to south boundary	8.4
Butte	21	A	Shippee Road to Oroville	6.7
Calaveras	24	A	West boundary to Valley Springs	10
Lassen	29	B	Coppervale to Susanville	15
			Total	104.5

The previous tables do not include the roads contemplated in the "$3,000,000 lateral" feature of the second state highways act. These roads are here listed together with certain other sections, the authority for the construction of which is not so clearly defined but is found by construing both state highways acts together:

County	Route	Section	Termini	Miles	Remarks
Monterey	10		San Lucas to east boundary	27	
Fresno	10	*A to F	West boundary to southeast boundary	54	
Kings	10	B	West boundary to Hanford	19.5	
Mariposa	18	*D to H	Mariposa to El Portal	32.6	
Trinity	20	*C to F	Douglas City to west boundary	60	
Humboldt	20	All	Trinity County line to Arcata	50	
Los Angeles	23	A	Saugus to Santa Clara River	4.8	Improved county road.
Los Angeles	23	B	Santa Clara River to Sec. 15, T. 4 N., R. 15 W.	1.9	
Los Angeles	23	C	Sec. 15, T. 4 N., R. 15 W. to Seeley's Ranch	8.4	Improved county road.
Los Angeles	23	E	Acton to Vincent	3.3	
Los Angeles	23	F and G	Palmdale to northern boundary	16	
Kern	23	All	Los Angeles County line to Inyo County line	80	
Inyo	23	*G to M	Southern boundary to Independence	79	
Inyo	23	A	Independence to Division Creek	10.2	
Inyo	23	*C to F	Fish Springs School to northern boundary	36.2	
Mono	23	*B to E	Sherwin Hill to Deadman Creek	27.7	
Mono	23	H and I	Tioga Pass Junction to Bridgeport	26.3	
San Bernardino	26	A and B	San Bernardino to southern boundary	12.4	Improved county road.
Riverside	26	*A to E	Northern boundary to Indio	51.8	
Riverside	26	F	Indio to Sec. 6, T. 7 S., R. 8 E.	8.6	5.5 miles under construction by county.
Riverside	26	G	Sec. 6, T. 7 S., R. 8 E. to Imperial County line	14.3	
Imperial	26	C, D, E	North boundary to Kane Springs	26.3	
Imperial	26	A,F,G,H	Trifolium Canal to El Centro	26.3	
Imperial	27	C, D, A	El Centro to The Well	36.8	
Imperial	27	B	The Well to Yuma Indian Reservation	7.5	5.1 miles plank road on part of Section B.
San Bernardino	31	A and B	San Bernardino to Summit	24	Improved county road.
San Bernardino	31	*C to F	Summit to Barstow	52.4	
Santa Clara	32	A, B, C	Gilroy to Merced County line	26.1	
Merced	32	A, B, C	Santa Clara County line to Madera County line	41.8	
Madera	32	A	Merced County line to Califa	15.7	
San Luis Obispo	33	A, B, C	Paso Robles to Kern County line	33	
Kern	33	A and B	San Luis Obispo County line to Hart Station	31.8	
Kern	33	C	Hart Station to Wasco	19	Improved county road.
Kern	33	D	Wasco to Famosa	7.5	
			Total	972.2	

*Inclusive.

The special "$3,000,000 laterals" will be discussed under that caption.

It is obvious that the gaps in the state highway system, exclusive of the special laterals, can not be constructed with what remains of the bond issue money and have the results satisfactory to anybody.

The main trunk lines will be left in good condition with few, if any, important links missing, but the extraordinary advances in the costs of labor, materials and transportation which have resulted from the war conditions have vastly lessened the purchasing power of the bond issue. The figures upon which the second bond issue was based were made up in the fall of the year 1914 and early spring of 1915. The money became available in August, 1917, except that $700,000 was transferred in the spring of that year from the Motor Vehicle Fund, which sum was returned to the Motor Vehicle Fund when the first block of the second state highway bonds was sold in August, 1917.

It is doubtful if any contract has been let since the beginning of the year 1917 which has not cost at least 50 per cent more than was estimated in 1914–15 to be required for the work.

FEDERAL AID ROADS.

In 1916, Congress passed an act, sometimes called the "Bankhead Act," by virtue of which the United States co-operates with the several states in highway construction.

The law was construed at first somewhat narrowly as concerns the type of road which might receive aid from the government, and unless it could be shown that the road was used in the carriage of United States mail, little consideration was paid to it. However, later, more latitude was given in this particular and it is now understood that almost any main road over which the mails are carried or over which, when improved, the mails are likely to go, will receive consideration.

California is unfortunate in the federal aid matters so far as its trunk lines of highway are concerned in that the most important roads usually parallel the railroads. This fact, however, may promote the earlier completion of certain mountain laterals elsewhere discussed.

Of the total sum appropriated by the Bankhead Act, California is entitled to the following amounts:

Fiscal year ending June 30, 1917	$151,063 92	
Fiscal year ending June 30, 1918	302,127 84	
Fiscal year ending June 30, 1919	456,167 32	
Fiscal year ending June 30, 1920	609,699 32	
Fiscal year ending June 30, 1921	755,000 00	(Estimated)
Total	$2,274,058 40	

The following projects have been approved by the Secretary of Agriculture, who has jurisdiction in federal aid matters, and the amounts stated are the sums which the government is expected to pay over to the state:

No. 1—Beresford to Redwood City, 4.24 miles	$ 35,327 20
No. 3—Southerly boundary of Contra Costa County to Richmond, 2.55 miles	24,244 56
No. 7—Redding to Tower House, 16 miles	105,334 24
No. 8—Douglas City to McDonald's Ranch, 48 miles	255,227 72
No. 9—Tecate Divide to easterly boundary of San Diego County, 15 miles	150,000 00
No. 10—Adin to Canby, 10.93 miles	34,594 17
Total	$604,727 89

Of the foregoing, Nos. 1 and 3 have been completed and the sum of $59,571.76 paid into the state treasury.

It is expected that the remaining approved projects will be prosecuted in the year 1919, it not having been possible during 1918 to commence any new federal aid projects on account of the war and the rulings of the United States Highways Council.

In addition to the post road feature of the Bankhead Act, the law provides for another class of co-operative work in the national forests. Under section 8 of the law California is entitled to approximately $140,000 per year for ten years, beginning June 30, 1916.

The commission has entered into co-operative agreements with the Department of Agriculture for the following work in the national forests:

> *Klamath River Road* (Happy Camp-Somes Bar Section), Klamath National Forest, Siskiyou County, approximately 45 miles in length, to be constructed by the U. S. government, the state of California to contribute $40,000 towards its cost.
>
> *Trinity River Road*, Trinity National Forest, approximately 34 miles in length, 13 miles in Trinity County, 21 miles in Humboldt County, 5 miles of the work (between Gray's Ranch and McDonald's Ranch) to be built by the U. S. government, and 13 miles (between Gray's Ranch and Redwood Creek) by the state of California, the 5-mile section to be built by the federal government to be considered a national forest project, and the 29-mile section to be built by the state of California a co-operative project.

As in the case of post roads, because of the war, it was not possible to undertake these constructions in 1918.

An important road which it is expected may benefit by the national forest co-operative money is the road in Mariposa County extending from Mariposa, the county seat, to El Portal, the gateway to Yosemite Valley.

Negotiations for co-operative funds with the Secretary of Agriculture for expenditure on this road have failed thus far but it is hoped that with the war over arrangements may be made for its construction in part as a national forest road.

Congress, the President, and the heads of several of the departments at Washington are showing much more interest in highway construction than heretofore, and there is much discussion of huge appropriations to be spent under government auspices in the building of a system of national highways.

This enlivened interest is because of several influences. The people have realized the great value of the highly improved European roads in the prosecution of the war. The motor truck industry has expanded greatly during the last year or two and, to some extent, the motor truck will supplant the railroad in the future, at least in short hauls for less-than-carload freight. Also, it is thought by many that a vast amount of public work should be provided for the soldiers returning from the war and, naturally, the infantile state of the highway improvement of the country offers a ready opportunity for the employment of many men, not only on the roads themselves but in the manufacture of tools and equipment and supplies, the need for which would develop rapidly should national highway work be undertaken on such a scale as seems to be contemplated.

CONVICT LABOR ON STATE HIGHWAYS.

The convict labor act of California was passed in 1915 (Chapter 124) and has been in operation for more than three years.

Work has been done by the convicts in Mendocino, Sierra, El Dorado and Calaveras counties, and in general the work has been excellent and the results economical as compared with the work of free labor camps.

It has been possible to do work in localities where it would have been exceedingly difficult, if not impossible, to employ free laborers, and in no case has the cost of the work equaled the cost of free labor.

As conducted, the savings have not been so great as were anticipated at the time of the passage of the act but nevertheless the plan has been beneficial, both to the state and of course to the convicts.

The Mendocino camps have used at one time or another about 770 men, many of whom have since been paroled. All of these men came from San Quentin. The other camps were manned from Folsom Prison.

Apparently the best results attained were on the Downieville lateral in Sierra County, both in the cost of the work performed and in the general morale of the camp.

The worst results were on the Placerville highway in El Dorado County where the men slept each night in Folsom Prison and were taken back and forth to and from the road each day.

The act provides definitely for dual responsibility in the management of the prison camps. The State Prison Board is responsible for the discipline of the camps and the California Highway Commission for the work performed. This dual authority has resulted in friction at times. The prison representatives at the camps have thought that they should have something to say as to the doing of the work and the highway representatives have tried to dictate in matters of camp management which did not concern them particularly.

Such difficulties are inevitable with human nature as it is but the Highway Commission and the Prison Board have never failed to adjust these troubles whenever they have been of sufficient magnitude to require their action.

The present policy is to allow the highway representatives to have complete control of the camps and the work, and the prison officials police the camps and look after the welfare of the men.

The highway fund pays nearly every expense of the work including transportation, clothing, and feeding the prisoners, paying the medical bills and even caring for their teeth.

It would seem that there should be some rebate on these expenditures since the prisons are relieved of practically all expense for the men after they leave the prison.

The prison guards are on the highway commission pay roll, which also carries all costs of escapes of prisoners and rewards for their capture.

Doubtless it would not be fair to rebate the cost on the basis of the per diem cost per man at the prisons since the use of the men on the highways does not lessen in direct ratio the cost of the prison administration but surely the prison fund should bear some charge on account of the lessened expense brought about by the absence of the prisoners.

During the period of the war, the convict work has been of very great economic value to the state.

In the Mendocino camps the division engineer reports that since the work began the cost per "effective man day" has been $2.53. While in normal times this would show little if any profit, during the war free labor received at least $3.00 per day net.

In Sierra County the cost for a period of five weeks in August and September, 1918, was $1.46 per "convict work day," a much better showing than in Mendocino County, but the period, it should be noted, is extremely short compared with the length of time included in the Mendocino case.

In Appendix "K" will be found some interesting reports by the division engineers of the commission under whose direction the convict work is in progress.

MOUNTAIN ROADS (SPECIAL APPROPRIATIONS).

It was the habit of the legislatures previous to that of 1917 to pass each year special appropriations for the construction or improvement of roads, chiefly in the mountainous counties where the counties were not able financially to provide the money themselves.

Many of the roads so improved were well worth the expenditure but as should be expected when there are no maps or proper estimates or even adequate reports available, some errors were made and certain roads were taken over by the state which are of little general benefit.

It would seem that strictly local benefits should not be the subject of special appropriations by the state. At least there should be some extraordinary impelling reason in such cases.

The 1917 legislature called a halt to such indiscriminate appropriations and as stated under the caption, "Special Surveys," there is now available much information concerning the most important of the projects proposed in that year.

In August, 1917, the State Engineer passed to the commission the jurisdiction formerly held by him over the special appropriation roads, and they have been cared for since by allotments from the State Motor Vehicle Fund. With one or two exceptions the former superintendents were retained under the new management.

The following table shows the distribution of these roads by counties and the mileage together with the divisions to which the roads are attached. The mileage of the several roads is somewhat approximate but in most cases the data are from the records of the State Engineer's office:

		Miles
DIVISION I.		
None in this division.		
Total for Division I		0.0
DIVISION II.		
Lassen County—Route 28—Lassen state highway		29.0
Sierra County (*a*)—Route 36—Sierra state highway		2.9
Trinity County—Route 35—Trinity-Humboldt state road		33.0
Total for Division II		64.9
DIVISION III.		
Alpine County—	Miles	
Route 34—Carson Pass Branch	14.1	
Route 23—Trunk line, El Dorado County line to Pickett's	2.3	
Route 23—Pickett's to Woodfords	6.3	
Route 23—Woodfords to Loop	12.5	
Route 24—Calaveras Branch Junction of Alpine trunk to Calaveras County	31.8	
Route 13—Sonora-Mono road, Sonora Pass to Brightman's Flat	12.5	
Total		79.5
Amador County—Route 34—Alpine road, Carson Pass Basin		57.8
Calaveras County—Route 24—Big Trees to Alpine County line		22.6

(*a*) 11.5 miles additional surveyed but not built.

DIVISION III—Continued.		
El Dorado County—		
Route 11—Placerville to state line	65.0	
Route 38—Myers-McKinney's	24.0	
Route 23—Osgood's to Alpine County line	10.7	
Total		99.7
Mariposa County—Route 40—Tioga road		2.2
Nevada County—		
Route 37—Emigrant Gap	11.1	
Route 38—McKinney's-Donner Lake	5.6	
Total		16.7
Placer County—		
Route 37—Auburn-Emigrant Gap	43.85	
Route 37—Emigrant Gap	14.7	
Route 38—McKinney's-Donner Lake	21.8	
Route 38—Myers-McKinney's	1.25	
Route 39—Tahoe City-Crystal Bay	11.2	
Total		92.8
Tuolumne County—		
Route 13—Sonora-Mono	31.5	
Route 40—Tioga road (exclusive of Yosemite Park)	50.8	
Total		82.3
Total for Division III		453.6
DIVISION IV.		
Santa Cruz County—Route 42——California Redwood Park		16.0
Total for Division IV		16.0
DIVISION V.		
None in this division.		
Total for Division V		0.0
DIVISION VI.		
Fresno County (*a*)—Route 41—Kings River Canyon (built)		14.5
Mono County—		
Routes 13 and 23—Sonora Pass to Bridgeport	34.0	
Route 40—Mono Lake Basin	12.3	
Route 40—Tioga Pass to Mono Lake Basin River	1.0	
Route 23—Alpine County line to Little Antelope Valley	9.4	
Route 23—Little Antelope Valley to junction Sonora-Mono road	17.0	
Total		73.7
Total for Division VI		88.2
DIVISION VII.		
San Bernardino County—Route 43—End of county pavement to most easterly point Great Bear Lake, say 60 miles.		
Total for Division VII		60.0

RECAPITULATION

	Miles
Division I	0.0
Division II	64.9
Division III	453.6
Division IV	16.0
Division V	0.0
Division VI	88.2
Division VII	60.0
Total	682.7

(*a*) On this road 32.8 miles were surveyed but the construction was stopped after 14.5 miles were built because of lack of funds.

The 1917 legislature by chapter 697 made a state highway of a portion of the so-called 101 mile drive in San Bernardino County, thus adding 60 miles to the mountain roads (nonbond issue roads) formerly under the care of the State Engineer but made no appropriation for its improvement.

Nearly all of this mileage of mountain roads, totaling 682.7 miles, is unpaved, the only exceptions being a few miles of rudimentary macadam work; much of it is too narrow for safety unless the motor car driver has had experience in mountain driving, and altogether these roads present a serious problem and one which enlarges as time goes on.

There is urgent need for expensive improvements on some of the more important of these roads, as for example, the Placerville-Lake Tahoe state road; the road passing Emerald Bay and extending to Tahoe Inn following in general the westerly margin of Lake Tahoe; also the road from Auburn to Lake Tahoe. (Myers-McKinney's, McKinney's-Donner Lake, and Emigrant Gap state roads.)

These roads, making as they do a circuit for travelers by motor to and from Lake Tahoe, are not suitable for the great and increasing traffic passing over them.

It is doubtful if they should be paved expensively at the present time as the season during which they are traveled is short, lasting from the time the snow leaves, usually in June, until the latter part of September, but much should be done to widen them and to ease the sharp curves and corners and to provide a wearing surface which will be comparatively free from the dust which now forms in many places almost as soon as the snow melts.

Such roads as the Kings River Canyon Road, which begins on the far side of General Grant National Park, in Fresno County, and goes part way toward the Kings River Canyon and ends nowhere, should be abandoned. Before one may travel this road he must pay a toll to the United States government since he must go through the Park to have access to the state road.

Also, a part at least of the Sonora-Mono state road where the grades are so steep that high power automobiles go over them with great difficulty, if at all. At the summit on this road the elevation is 9,624 feet. A portion of this road is used mostly for the passage of cattle and sheep and should be abandoned to the county.

Also, the so-called Sierra state highway of which 2.9 miles have been built out of the 20 miles contemplated by the 1907 legislative act. Of this road, State Engineer W. F. McClure in his biennial report for 1914–16 said, "This road would be about 20 miles long if completed. Less than three miles have been constructed at a cost of nearly $12,000. In its incomplete condition it does not afford convenience to any considerable number of people and if completed would not connect any important centers of population or industrial activity; nor will it afford Downieville a good means of reaching the Sacramento Valley * * *. The suggestion is here made that the road be abandoned as a state road."

Investigation by the engineers of the commission confirms Mr. McClure's judgment. The road seems to serve only a partly abandoned mine.

THE THREE-MILLION-DOLLAR LATERALS.

The second state highways act (1915; Chapter 404) sets aside the sum of $3,000,000 for the construction of the following projects, all to be "by the most direct and practical route":

> An extension connecting the interior and coast trunk lines in northern California through Trinity and Humboldt counties;
>
> An extension connecting the San Joaquin Valley trunk line at a point between the city of Merced, in Merced County, and the city of Madera, in Madera County, with the coast trunk line at or near the city of Gilroy, in Santa Clara County, through Pacheco pass;
>
> An extension of the Mariposa County state highway lateral to or near the railway station, El Portal, in Mariposa County;
>
> An extension connecting the San Joaquin Valley trunk line in Tulare County with the coast trunk line in Monterey County by the continuation of the lateral between the cities of Visalia and Hanford through Coalinga;
>
> An extension connecting the San Joaquin Valley trunk line at or near Bakersfield with the coast trunk line in San Luis Obispo County, through Cholame pass;
>
> An extension of the San Bernardino County state highway lateral to Barstow, in San Bernardino County;
>
> An extension connecting Antelope Valley, in the county of Los Angeles, with the city of Los Angeles;
>
> An extension of the San Bernardino County state highway lateral to the Arizona state line near the town of Yuma, Arizona, via the cities of Brawley and El Centro, in Imperial County.

The act, however, provides that the "expenses of the acquisition, construction and improvement of the extensions enumerated and the acquisition of rights of way therefor, shall be partly borne by the county or counties in which such extensions lie, the extent and character of such division of expenses between the state and county shall rest for final determination with the State Department of Engineering and said department is hereby authorized to enter into such agreements and undertakings as are necessary to properly carry out the intent of this section."

These several extensions were included in the second state highways act during the last stages of its passage by the legislature and without knowledge of the probable cost entailed, there being neither surveys, maps nor estimates available upon which accurate judgment could be based. Not even the lengths of the several roads included were known, even approximately.

So soon as might be after the passage of the act, the commission ordered surveys made of the several roads together with reports and estimates. The surveys were more or less of a preliminary nature, the idea being to have some reasonable basis upon which to discuss the relative shares which the state and the counties involved should contribute toward the cost of the projects.

It is manifest that some of the counties through which the proposed routes pass are unable to contribute much, if anything, toward the cost of the projects, and while it is generally understood that the legislature intended that the counties and the state should each bear one-half of the cost, it is difficult to see how such counties as Trinity and Mariposa, the former in 1916[a] having a total valuation of $3,431,979 and the latter of $3,795,101, can pay anything toward the amount required for the costly work proposed within their boundaries.

There was one fixed feature in the act. The state can spend but $3,000,000.

The reports and estimates of the engineers made in September, 1917, indicated a total length of 679.71 miles for seven[b] of the projects and a total cost of $8,963,675 as the cost of building them.

The following table shows the estimated length and cost of each of the seven laterals:

	Length, miles	Estimated total costs	Percentage of lateral cost to total	State's portion, based on foregoing percentages	Counties' portion of each lateral
Trinity lateral	102	$1,175,000	.13108	$393,240	$781,760
Pacheco Pass	83.45	1,618,413	.18055	541,650	1,076,764
Mariposa	32.60	533,554	.05952	178,560	354,997
Coalinga	98.25	1,502,538	.16762	502,860	999,678
Cholame Pass	91.22	1,339,596	.14944	448,320	891,275
San Bernardino to Barstow	76.33	534,112	.05959	178,770	355,342
San Bernardino to Yuma	195.86	2,260,462	.25217	756,510	1,503,949
Totals	679.71	$8,963,675	.99997	$2,999,910	$5,963,765

At this stage of the study the supervisors of the several counties interested were invited to Sacramento to confer with the commission in order to establish the general principles to be followed.

The conference was held on September 26, 1917, and representatives from all but one of the counties were present.

At the meeting the following understanding was arrived at:

> 1. That the moneys should be expended in permanent types of construction in the discretion of the commission as far as it would go.
>
> 2. That it was the sense of the meeting that the plan of apportionment of funds proposed by the commission of the $3,000,000 be approved. (See foregoing table.)

Both of these votes were unanimous.

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[a] See Schedule "8," Summary of Assessed Values of nonoperative property as reported by County Auditors to the State Tax Commission for 1916. (Report of State Tax Commission, 1917, page 175.)

[b] The eighth project, here omitted, is "An extension connecting Antelope Valley in the county of Los Angeles, with the city of Los Angeles." Why this project is omitted is explained in Appendix "M."

It was also arranged that the commission should later go to the localities to discuss the details of each project with the supervisors, and such meetings were held at San Bernardino, Bakersfield, and Fresno in the fall of 1917.

The estimates of cost shown in the foregoing table are based upon the joint wishes of the commission and the county officers in so far as the types of road are concerned. In some cases paved roads are contemplated while elsewhere graded roads only are provided. Also, so far as the commission understands the case, there is no lack of agreement as to the locations of the projects.

However, to November 30, 1918, there has been almost no activity as concerns these special laterals. It is true that in Riverside County both the state and the county have done or have made arrangements for the building of short sections of the San Bernardino to Yuma project. Also, that San Luis Obispo County desires to proceed and is said to have set aside a small allotment for a portion of the Cholame Pass lateral, but these are but small undertakings in a total project involving nearly $9,000,000.

It is probable that the war has played some part in the delay but the fact remains that the counties can not afford to pay their share on any such basis as is apparently contemplated in the act.

The estimates for these laterals were prepared in the summer of the year 1917. At that time it was apparent that the counties would have to bear two-thirds of the cost of the roads but at the present time, at the prevailing cost of labor and materials, both much increased since 1917, the counties must bear a considerably greater share of the cost.

As before stated, the state can spend but $3,000,000 as its share of the cost.

The roads included in the "$3,000,000 laterals" are all important ones. The commission sees no reason why they should not be constructed and paid for by the state as are the other roads in the system. In general, they are of much greater importance to the state at large than are some of the laterals to the county seats provided for in the first state highways act.

MAINTENANCE.

The maintenance of the state highways is of ever growing importance.

At the close of the fiscal year in 1918, there were under maintenance 1,450 miles of highways constructed by the commission, 167 miles of paved highway which were on state highway routes and which had been taken over from various counties, and 683 miles of mountain roads, most of which were under state control prior to the formation of the California Highway Commission, a total of 2,300 miles of roads and highways.

The highways built by the commission have always attracted travel to them and in a number of instances, much money should be spent now in widening the pavement and in constructing shoulders to take care of the greatly enhanced traffic.

Not only have the vehicles increased greatly in number but the loads carried have increased enormously in weight and because of the non-enforcement of the terms of the Motor Vehicle Act, it is the rule rather than the exception to overload the motor trucks, and the roads are doing much more duty than they were intended to do when constructed.

The state highway maintenance work is financed wholly by the Motor Vehicle Fund which is derived from the fees paid annually by motor vehicle owners and operators into the state treasury.

Under the present law (Vehicle Act of 1915, amended 1917, Chapter 218), after deducting from the total receipts of the Motor Vehicle Department the operating expenses of that department, the balance remaining is divided into two equal parts, one part going to the State Motor Vehicle Fund for use in maintaining the state highways, the other part being paid to the several counties of the state for their use in maintaining the county roads.

Following is a tabulation showing the amounts available for state highway purposes from the State Motor Vehicle Fund for each of the several calendar years since the Motor Vehicle Fund has been operative:

(*a*) 1914	$591,228 57
(*a*) 1915	932,492 78
(*a*) 1916	964,784 65
(*a*) 1917	1,247,268 80
(*b*) 1918	1,395,817 89
(*a*) Total	$5,131,592 69
Assigned to State Engineer	586,450 86
Total available for use of California Highway Commission	$4,545,141 83

During the same period the counties have had available the sum of $5,131,592.69 for expenditure on county roads.

In Appendix "P" will be found a table showing how the sum of $1,395,817.89 for the first six months of the year 1918 was distributed among the several counties.

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[a] Includes amounts allotted to State Engineer.

[b] The sum for 1918 is for the first six months only.

The expenditures for state highway maintenance and improvements for the several years during which the Motor Vehicle Fund has been in existence follow:

Expenditures by California Highway Commission from Motor Vehicle Fund.

Calendar Years.	
1914	$83,935 85
1915	454,894 40
1916	1,189,812 10
(a) 1917	772,483 15
1918 (first six months)	406,552 28
(b) Total to June 30, 1918	$2,907,677 78

In Appendix "J" will be found a table showing an analysis of the maintenance expenditures for the calendar years 1914 to 1917, inclusive.

It is becoming increasingly apparent that more money will soon be needed for the upkeep of the state highways than is provided by the existing law.

It is interesting to note that other states as well as California are suffering from the selfish overloading of vehicles. In a recent paper written by H. Eltinge Breed, First Deputy Commissioner of Highways, New York State, he says:

> "Second, we must definitely eliminate our worst unknown factor—the weight of the load. For the past fifteen years we have built roads that have attracted to themselves traffic far greater than they were designed to bear, to the alarming depreciation of the investment in the road. The faster we build roads, and the better, the greater and heavier will be the traffic put upon them, until thousands of miles are destroyed and millions of dollars lost. Only within the past year have we in New York State caught up with the demands of the passenger car for completed through routes, and now the truck is upon us, and roads designed for three tons are having twenty put upon them. They are going to pieces. Five millions a year are being spent in repairs, where at least half of it should be going for new construction. The thing is inevitable until we agree upon some arbitrary limit of load for which we are to design the highways.
>
> "It was exactly the same with the railroads, the track and the engine forever outstripping each other with enormous economic loss, until an arbitrary limit of load and speed was determined upon. Increases upon it since then have had to be of proved economy from the point of view of considering both the 'tool' and the 'way.' In any system of transportation, those two must be reconciled before we can derive full benefit.
>
> "Look at our latest traffic reports on fifteen highways in various parts of New York State. There is an increase in truck tonnage varying biennially from 50 to 400 per cent and an average increase of 150 per cent over the tonnage of 1916. To try to build highways in pace with a continuous advance of that kind would bankrupt the public.
>
> "The wiser motor-truck manufacturers have themselves adopted the broad policy of selling transportation service, rather than the exclusive one of selling motor trucks. These men, who have had every opportunity to study the economics of the problem, have agreed upon the desirability of the five-ton load as a standard unit. This should now be established by law, and our highways designed to meet it. It will mean a total maximum load of about 12½ tons, of which approximately nine shall be applied to the rear axle. There should

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[a] In August, 1917, the California Highway Commission assumed charge of certain mountain roads formerly under the jurisdiction of the State Engineer and thereafter the expenditures therefor are included in this table.

[b] In addition to this total expenditure the sum of $549,000 in round numbers was allotted but not expended by June 30, 1918.

> also be general regulations for other destructive factors, such as inadequate tires and springs.
>
> "We can build roads economically for the five-ton load. We can not afford to have them disrupted by a few excessively large trucks. Nor should we design them extravagantly to meet the requirements of a few individuals. The maximum loading must be restricted to the economic standard suggested by the manufacturers and desired by the big majority of truck users. Then will the highway be able to give to the motor and to the community its most efficient service."

Subsection "*c*" of section 15 of the California Vehicle Act before referred to reads as follows:

> "*Motor vehicle weight limitations.*
>
> "(*c*) No motor or other vehicle or other object or contrivance for moving loads, except as hereinafter otherwise provided, shall be operated or moved upon or over any public highway or bridge, the weight of which resting upon the surface of said highway or bridge exceeds eight hundred pounds upon any inch of width of tire, when said vehicle is equipped with tires made of other material than metal; and no motor or other vehicle, object, or contrivance for moving loads shall be operated or moved upon or over any public highway or bridge, the weight of which resting upon the surface of said highway or bridge exceeds six hundred pounds upon any inch of width of tire, roller, wheel or other object supported on the surface thereof when such tires or the rolling surface of such rollers, wheels or other objects are made in whole or in part of metal, without first obtaining a permit as hereinafter in this section provided; *provided, however,* that traction engines or tractors the propulsive power of which is exerted not through wheels resting upon the ground but by means of a flexible band or chain, known as a movable track, shall not be subject to the foregoing limitations upon permissible weights per inch of width of tire if the portions of the movable tracks in contact with the surface of the highway present plane surfaces; *and provided, further,* that cities heretofore or hereafter organized under freeholders' charters may permit or prohibit the increase, beyond the maximum weight per inch of width of tire hereinabove prescribed, of the weight of loads carried within the limits of such cities in or upon metal tired vehicles drawn by muscular power, but where any such city has not by proper and suitable ordinance or other regulation permitted or prohibited such increase of maximum weight of loads, the regulations and limitations prescribed by this act shall not apply."

Here is a law very much like what New York state is asking for but of what avail is it? There is no real attempt to enforce it here nor will there be until the state has an adequate force of inspectors.

SPECIAL SURVEYS ORDERED BY THE LEGISLATURE OF 1917.

At the 1917 session of the legislature, a large number of bills were presented calling for special appropriations from the General Fund for the improvement of a number of roads in widely-scattered localities. The total sum asked for was impressive in magnitude. The Roads and Highways Committee had little or no information on which to base its judgment in acting upon these proposed appropriations. In most cases no surveys or estimates of cost worthy of the name had been prepared and as a result, but one road appropriation bill was passed and signed by the Governor.[a]

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[a] The single exception was the Susanville-State Line road in Lassen County, for which $60,000 were appropriated conditioned upon a like appropriation by the county. The county has not been able yet to finance its part of the cost and the project is inactive.

The legislature, however, did pass an act (1917, Chapter 746), which, together with certain other features, calls for the survey and estimates of cost of such of the projects which had been presented to it as the committee considered to be worthy of investigation. These roads were:

> An extension of the Trinity-Humboldt state road, from its westerly end, in a westerly direction, to the town of Bridgeville, in Humboldt County;
>
> A highway beginning at or near Oxnard, in Ventura County, California, and extending to a point near San Juan, in Orange County, California;
>
> A highway from Jackson's Ranch, near Pescadero, in San Mateo County, California, to Governor's Camp, in the California Redwood Park, Santa Cruz County, California;
>
> A highway beginning at Carmel, in Monterey County, California, and running thence in a southerly direction to San Simeon, in San Luis Obispo County, California, and a lateral highway from a point most feasible thereon to a point at or near Jolon, in said Monterey County;
>
> A bridge to span San Francisco bay at or near Dumbarton Point;
>
> And a highway from the western boundary line of Kern County, California, to the state highway near the city of Santa Maria, Santa Barbara County, California.

The surveys and estimates have been made by the commission of nearly all of these proposed projects and the plans and reports are on file in its office.

THE VEHICLE ACT.

The Vehicle Act (Chapter 218, Statutes of 1917) is a very important piece of legislation in its effects on the work of the commission.

From the Motor Vehicle Fund which it creates the state derives all its money for the maintenance of the state highways (see section 34).

The act specifies in section 15 the permissible loads which vehicles may carry on the highways.

Section 22 provides for special speed regulations on the state highway when ordered by the commission.

The commission, in section 32, is given certain jurisdiction over operators of motor vehicles when they misbehave under certain conditions.

In section 34 the county supervisors are required to make reports annually of the expenditures made by them out of the county road funds derived from the Motor Vehicle Fund.

The commission has no particular comment to make concerning the Motor Vehicle Fund save that as stated under the captain "Maintenance," the portion which the commission receives for state highway maintenance is not sufficient to make the necessary repairs and improvements. The needs due to increasing traffic are advancing faster than the fund increases.

The commission believes that in general the provisions of section 15 concerning the permissible loads which may be carried are reasonable for all parties concerned. The difficulty is in the nonobservance of the rules prescribed by the act and the inability and in some cases the negligence of the police authorities in their enforcement.

The commission believes that until a number of inspectors are appointed by the state to enforce the law, and the number need not be very large, the highways are bound to suffer from the selfishness of the owners of trucks and tractors. Such owners represent an extremely small proportion of the users of the highways and there is no good reason why they should be permitted to overload their vehicles or cut the roads with their tractors.

A force of a dozen state inspectors whose sole duty is to enforce the provisions of the Motor Vehicle Act would correct these evils quickly. The local authorities can not do it.

Acting under that portion of section 22 which permits the commission to lessen the permissible speed on a bridge, dam, trestle, culvert, causeway or viaduct as well as the maximum rate of speed over any state highway or portion of state highway, the commission on petition has passed the necessary orders and caused to be erected signs in the following localities:

On either side of the Davis subway, Yolo County;
On either side of the Andora subway, Placer County;
At Salida, Stanislaus County;
At Newcastle, Placer County;
In the vicinity of the main entrance to the Napa State Hospital, Napa County;
On the trestle approach to the municipal wharf at Martinez, Contra Costa County;
At Camp Fremont, San Mateo County;
At the intersection of the Saratoga road with the state highway, Santa Clara County;
On the concrete bridge between Eagle Rock and Pasadena, Los Angeles County.

This section which does away with the old ten-mile-per-hour speed on bridges, etc., is a marked improvement. The lack of necessity for such a low speed limit in such cases is apparent since this commission in the year and a half period since the law became effective has had but two applications for restricted speeds on bridges. The thirty-mile-per-hour speed now generally allowed on bridges seems to be reasonable.

The provisions of section 32 require the commission to hold hearings to determine whether the licenses of operators or chauffeurs convicted of driving motor vehicles while intoxicated, or convicted for the third time in a calendar year of speeding, shall be revoked or suspended.

The same jurisdiction is given to the commission in cases of reckless drivers or of persons incompetent or unfit to operate motor vehicles because of a mental or physical infirmity or disability.

To take care of these matters promptly the commission has decided to have a single commissioner, usually the member residing nearest to the operator involved, hear the case and report thereon to the full board at its next meeting thereafter.

No formal complaints under this section reached the commission until late in the year 1918, since which time the following cases, all based on court convictions of driving while intoxicated, have been heard:

Date of hearing	Place of hearing	Defendant	Judgment
Nov. 7, 1918	Sacramento	John Rothwell	Judgment withheld pending good behavior of offender.
Nov. 7, 1918	Sacramento	Allen Harris	No cause found for revoking or suspending license.
Nov. 8, 1918	Modesto	J. H. Boren	License revoked for remainder of 1918.
Nov. 8, 1918	Modesto	Robt. Clairn	License revoked for remainder of 1918.
Nov. 14, 1918	San Luis Obispo	Dennis M. Herrold	License revoked for remainder of 1918.
Nov. 18, 1918	Sacramento	C. D. Judd	Judgment withheld pending good behavior of offender.
Nov. 18, 1918	Sacramento	R. E. Allen	License revoked for remainder of 1918.
Nov. 19, 1918	San Francisco	Geo. W. Browne	License revoked for remainder of 1918.
Nov. 19, 1918	San Francisco	Felix Boswell	Action suspended.
Nov. 19, 1918	San Francisco	John E. Keer	Action suspended.
Nov. 19, 1918	San Francisco	John R. Dyer	Action suspended.

It is the opinion of the commission that this right of revocation of operators' licenses properly belongs to the original licensing authority. If all the cases which could properly come to the attention of the present reviewing authority, were referred to it, the highway commissioners would have time for little except license hearings.

The commission realizes the value of applying restraints upon intoxicated drivers, and believes that the question is of sufficient importance to warrant providing the Motor Vehicle Department with the machinery for strictly enforcing compliance with the law, the expense to be met from the Motor Vehicle funds.

The provision of section 34 which requires the county boards of supervisors to report their expenditures out of the county road funds derived from the State Motor Vehicle Fund became operative for the first time on March first of the year 1918. Most of the counties reported promptly but some were very slow and one county, Mono, has not reported to date.

The law provides that the reports shall be made on forms prepared by the State Department of Engineering.

The forms so prepared were somewhat complicated and the returns made thereon were extremely crude in many instances and generally disclosed the fact that in most instances the money paid over to the counties by the state was merged with other county road funds and no special account kept of it.

This was more or less expected and the reports were not examined overcritically. Few of the county officials knew the law was in existence and in several cases better reports were promised for the year 1919.

One fact stands out, however. It seems to be a rather general practice for the counties, particularly the smaller ones, to divide the money received from the state into five equal parts, one for each supervisor, thus dissipating the fund and accomplishing little useful work.

The law apparently intended that the money should go into a special road fund, perhaps a general fund, and be used for specific work.

In Appendix "P" will be found a table showing how the counties' share of a portion of the 1918 receipts (Period January 1 to June 30, inclusive) of the State Motor Vehicle Fund was divided among the counties.

It is interesting to note that Los Angeles County receives nearly 15 per cent of the total net receipts earned by the Motor Vehicle Department for the period stated, and nearly 30 per cent of the total sum paid over by the state to the counties.

BRIDGES.

Most of the large bridges on the state highways have been built or paid for by the counties in which they are located, and estimating roughly it is conservative to say that not less than $3,000,000 have been spent by the counties in this manner for the benefit of the state as well as for their local use.

The plans for these bridges in nearly all cases were either made by the Commission's engineers or the plans and estimates were checked by the engineers at the headquarters office. In Appendix "L" will be found a statement by R. E. Dodge, office engineer, who has had direct charge of the bridge work, together with descriptions of some of the larger of the bridges referred to.

After their completion and acceptance these bridges become a part of the state highway system and are maintained by the state.

RAILROAD CROSSINGS.

The elimination, or at least the greater safeguarding of railroad crossings, has been the aim of the California Highway Commission in its development of the state highway system.

Surveys have been made with these objects in view, as for illustration, between Redding and the north boundary of the state some thirty grade crossings have been eliminated, and when the plans of the commission fully mature there will not be a main line railroad grade crossing on the state highway between the south line of Tehama County and the Oregon line.

A number of overhead crossings and subways have been installed at the joint cost of the state and counties and the railroad companies, and other such structures are projected for the near future.

The work of installing such improvements has been temporarily suspended, however, on account of the United States Railroad Administration not at present devoting funds for the purpose, but an early resumption of co-operation on the part of the railroad authorities is hoped for.

California has no statutes fixing a basis for the division of costs in cases of separation of grades as between the railroads and the state or counties.

The matter of the division of costs is left to the determination of the Railroad Commission of California.

While the elimination of all grade crossings on the state highway would be most desirable, yet the cost thereof would be absolutely prohibitive.

Therefore, it has been the endeavor of the California Highway Commission to eliminate crossings which have constituted the greatest menace and to rectify the others as far as possible. The railroad companies and the commission have co-operated to the latter end by the installation of automatic flagmen, removing obstructions to view and otherwise improving safety conditions at grade crossings.

Ordinarily the commission and the railroad companies have been able to agree in advance upon the division of costs in the construction of overhead crossings and subways, which preliminary agreements have always been ratified by the Railroad Commission.

The usual practice in such cases has been for the railroad companies to bear one-half, the public the other half, of the cost of installation.

In several places the commission, believing that such a course was for the best interests of the traveling public, has planned what are commonly known as "skew" subways instead of right angle crossings.

In Decision No. 2026 of the Railroad Commission on the application of the state for permission to construct a "skew" subway under the track of the Southern Pacific Company near Andora about one mile north of Roseville, Placer County, Railroad Commissioner Gordon was of the opinion that a 45° "skew" subway was safer than right-angle undercrossing. However, he advanced the theory that a right-angle crossing would serve the purpose of a grade separation just as well as a "skew" crossing as far as the railroad company was concerned, the "skew" crossing, in his judgment, being but a refinement in the interest of vehicular traffic on the highway. Accordingly, he held that the public should bear a greater share of the cost of a "skew" undercrossing than the railroad company.

The Railroad Commission issued an order in this case that the railroad company and the state should each pay one-half of the estimated cost of a right-angle crossing and the railroad company one-fourth and the state three-fourths of the difference between the estimated cost of a right-angle crossing and the actual cost of the "skew" crossing.

The California Highway Commission has never been satisfied with this ruling as it feels that the cost of a "skew" crossing should be divided equally between the railroad companies and the state just as in the case of a right-angle crossing, and do not propose to permit Decision 2026 to become a settled precedent without further objection.

The railroad companies have co-operated with the California Highway Commission in joint enterprises for the mutual protection of the railroads and the traveling public.

Two notable instances have been the construction of seawalls and the installation of two subways between Ventura and Santa Barbara where the state and the Southern Pacific Company shared the expense, and in northern California the construction by the Southern Pacific Company of an overhead crossing at Black Butte and a subway at Bailey Hill, both in Siskiyou County, in consideration of the state constructing overhead bridges over the Southern Pacific Company tracks at Dunsmuir, Siskiyou County, and Salt Creek, Shasta County.

The Railroad Commission has ordered the elimination of two dangerous grade crossings—one east of Altamont, Alameda County, and the other west of Altamont—at the joint expense of the Southern Pacific Company and the county of Alameda, and the construction of two overhead crossings at an estimated cost of about $75,000 at these two points. This important work will probably be commenced just as soon as the United States Railroad Administration acquiesces in the commencement of operations.

Another important subway under the tracks of the Southern Pacific Company near Red Bluff on the state highway has been ordered built by the Railroad Commission, one-half the cost chargeable to the Southern Pacific Company, one-fourth to the county of Tehama, and one-fourth to the state of California. This needed improvement is also awaiting action by the United States Railroad Administration.

Among some of the other structures on the state highway which have been installed to eliminate grade crossings are the following:

Subway, Grant Station south of Healdsburg, Sonoma County, one-half cost borne by state of California, one-half by Northwestern Pacific Railroad Company.

Overhead bridge crossing Southern Pacific Railroad near Ellwood, Santa Barbara County, built by the county.

Subway, Coyote Wells, Imperial County, constructed at the joint expense of the state of California and the San Diego and Arizona Railroad Company.

Overhead bridge, Riverbank, Stanislaus County, one-half cost chargeable to Atchison, Topeka and Santa Fe Railroad Company, one-fourth to county of Stanislaus, one-fourth to state of California.

Subway, Davis, Yolo County, one-half cost borne by state of California, one-half by Southern Pacific Company.

Subway, Las Flores, north of Oceanside, San Diego County, one-half cost borne by state of California, one-half by Atchison, Topeka and Santa Fe Railroad Company.

Pit River bridge, Shasta County, crossing Sacramento Valley and Eastern Railroad, built by state of California, part of expense being paid by county. Crossing of railroad incidental to crossing of river.

Eel River bridge, Scotia, Humboldt County, crossing Northwestern Pacific Railroad, built by state of California, part of expense being paid by county. Railroad crossing incidental to river crossing.

Subway, near Niles, Alameda County, under Southern Pacific Railroad, built by county of Alameda.

ACCIDENTS ON STATE HIGHWAYS.

It has been the endeavor of the California Highway Commission to so plan the state highways and so conduct construction work that accidents to the traveling public may be reduced to a minimum.

It has been a noteworthy fact that in the entire history of this commission's activities that only in one instance has the commission been made a party to a suit for damages for personal injury, and in only two or three instances have the state highway contractors been defendants in similar cases.

The contracts between the state and its contractors are very rigid in their requirements that the contractors shall provide adequate warning signs, barriers and lights, and the burden of properly safeguarding the traveling public is imposed upon the contractors in such forceful terms that the contractors have rarely failed to faithfully perform their duties in this respect.

The only personal injury case in which the commission was joined with one of its contractors as a defendant was recently decided in favor of the commission and the contractor by the Third Appellate District Court, *Buckingham* vs. *Commary-Peterson Company,* Vol. 27. California Appellate Decisions, page 844.

This case is of interest for the principles which have been recognized thereby.

The plaintiff in this case was injured by the automobile in which he was riding in the early hours of the morning being driven into a culvert excavation which had been left in a section of state highway in course of construction. Plaintiff resided near the work and had in fact for a time previous to the accident operated a pumping plant on the very road being built.

He admitted knowledge of the several barriers and signs directing traffic off this particular road, which he had to pass before he reached the culvert in question; and that the machine had followed a very rough and meandering course over torn-up roadway before it reached the portion of the highway in which the culvert was encountered.

Plaintiff urged that notwithstanding these facts that the contractor and commission should have erected formidable barriers and maintained lights at the particular excavation itself.

Plaintiff admitted that his machine was running at a rate of twenty-five or thirty miles an hour at the time it struck the excavation, but that he had heard rumors that the stretch of highway at the culvert hole was ready for traffic.

Justice Hart, of the Appellate Court, held that there could be no recovery against either the contractor or the commission because plaintiff had been guilty of contributory negligence.

Moreover, the commission could not be held liable for any damage to third parties which might follow from acts of negligence by a state highway contractor, committed in the performance of his contract, the contractor being an independent contractor and alone responsible.

The court further held that as plaintiff knew the general condition of the highway it was unnecessary to maintain barriers and lights at the culvert hole, and moreover, that any person who uses and is injured on a defective highway, knowing or having reason to know that it was then in process of construction and for that reason is not open to general use by the public, is himself guilty of negligence unless he has used such highway because it was *necessary* to do so, and even in such case, he must exercise great care.

The commission believes that the reasonableness of the opinion that the commission should not be responsible for the omissions and commissions of independent state highway contractors is apparent.

At times scores of contracts are in progress in widely-separated portions of the state and if the commission was liable in case of every dereliction of the state's contractors, the burden of responsibility would be intolerable.

SPECIAL FREIGHT RATES.

From the beginning of its active work of construction until August, 1918, the commission was favored by special freight rates made by nearly all of the railroads of the state. As a rule the commission paid but one-half of the class rates and special commodity rates were allowed which were often considerably less than one-half of the traffic rates on such items as cement, rock, sand, gravel, oil and asphaltum.

No accurate summing up of the savings due to these reduced freight rates has been made but several hundred thousand dollars were doubtless conserved thereby for other uses.

On August 5, 1918, these special rates were abolished by order of the United States Railroad Administration and full tariff is now paid on all shipments.

The purchasing agent in his statement in Appendix "G" estimates that the total average increase in rates on all shipments will equal perhaps 250 per cent.

PORTLAND CEMENT AND CONCRETE AGGREGATE PURCHASES.

During the period from the beginning of the work to June, 1918, the commission bought for its state highway construction a total of 1,780,000 barrels of cement.

Under an unwritten agreement, the companies agreed with the commission that during the life of the work the price should not exceed $1.40 per barrel at the mills. This special price, far below the general market price, was made to encourage the use of cement in highway construction.

After the first bond issue of $18,000,000 was exhausted, the companies felt that their obligation should end and thereafter the price increased steadily until the government fixed the price for cement bought by it during the war. From that time the commission paid the government price, which at the end of 1918 is $1.95 per barrel at the mills.

In Appendix "N" will be found a full statement of the commission's transactions with the cement companies for the period 1912 to 1918.

The average price per barrel during this entire period is shown to be $1.345 per barrel at the mill.

In 1912 the commission made two large contracts for the supply of concrete aggregates for use in the central and northern parts of the state where such materials are not so well distributed as in the south. The largest of these contracts was with the Natomas Consolidated of California for 500,000 tons at the rate of 45 cents per ton; the other with the Grant Gravel Company and Russian River Gravel Company for 175,000 tons at 27½ cents per ton.

The Natomas supply came from Fair Oaks, in Sacramento County, and from Oroville, in Butte County, The Grant Gravel Company is located in the Livermore Valley in Alameda County, and the Russian River Gravel Company at Healdsburg, in Sonoma County.

All of the material contracted for and more was used in the work, and because of the reduced freight rates established by the railroads, the commission was enabled to ship the stone and sand to unusual distances. Some of the Natomas product was carried as far as Malaga in Fresno County, a distance of 192 miles.

After the expiration of these contracts for aggregates the prices advanced slowly until in 1918 both companies charged 60 cents per ton.

The purchases from these two companies were but a fraction of all the requirements for these materials, but the contracts tended to fix a low price, which had its influence on other producers of concrete aggregates throughout the state.

TREE PLANTING AND CAMP SITES.

The commission believes that much more should be done to beautify the roadsides than has been attempted heretofore.

In many instances county officers or improvement clubs have planted trees along the state highways and the commission has co-operated with them in caring for the trees.

In Kern County on the long tangent[a] south of Bakersfield trees were planted by the county several years ago and the commission has been looking after them. About ten miles of water pipe was purchased from the contractor who built the highway to supply the trees with water. The road is in the desert, and when grown, the trees will make a magnificent avenue of what is now a long, straight, tedious, desert road over which everybody now drives at top speed to get over it as quickly as possible.

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[a] It is believed that this is the longest stretch of road without a curve or angle in the state. From the foot of the grade near the General Petroleum Company's oil pumping plant the road extends northerly in a perfectly straight line for seventeen miles.

Much remains to be done, however, and the commission hopes in the immediate future to set out many trees, particularly in the valleys.

Already it is arranging with State Forester Homans for the installation of a tree nursery where young trees may be planted and cared for until they are ready for setting along the roadsides. Mr. Homans' recent recommendation to the legislature for such a nursery is heartily endorsed by the commission.

Many of the roads now under the care of the commission are in the mountains and lead to ideal places for camping. In many places the roads cross streams excellent for fishing.

It is the opinion of the commission that when rights of way are being secured for highway purposes it would be often an easy matter, at small cost, to secure additional land for camp sites in such localities, not necessarily large areas but sufficient in size to accommodate several camping parties at one time, and the engineers of the commission have been instructed to keep their eyes open for such opportunities.

CONCLUSION.

To the California Highway Commission was entrusted the construction of the state highway system.

The accomplishments which have attended its efforts are herein reviewed, and the obstacles which it has encountered in its activities explained.

The framers of the original ''State Highway Act'' conceded that $18,000,000 would not finance the system therein prescribed, but notwithstanding the admittedly impossible task, the commission endeavored by the employment of every honorable expedient to obtain the greatest possible return in roads for the money thereby provided.

The people by an overwhelming majority at the general election of 1916 evidenced their confidence in the good faith of the California Highway Commission by ratifying a second state highway bond issue of $15,000,000.

But the untoward conditions accompanying the world war soon set at naught the expectation of completing the state highway system with the proceeds of the second bond issue, and the commission for a second time, confronting an impossible task in so far as finishing the work is concerned, is again forced to the only alternative, namely, to secure the greatest value receivable with the funds at its command.

The present state highways are being subjected to constant abuse by too heavily loaded trucks and other agencies.

The statute books of California already contain sufficient legislation to regulate and penalize these violations, but the delinquency lies in the enforcement of these laws.

The commission is of the opinion that the most effective policing of these evils will result from the establishment of a state motor police limited both in numbers and authority, under the jurisdiction of the Motor Vehicle Department, who could apprehend both motor vehicle offenders and persons injuring the improved highways of the state.

The data embodied herein may suggest still further legislation and any co-operation by the legislature of 1919 tending to the betterment of state highway work will be appreciated by the commission.

Respectfully submitted.

NEWELL D. DARLINGTON.
CHAS. A. WHITMORE.
EMMETT PHILLIPS.

Sacramento, December 31, 1918.

APPENDIX A.

THE COMMISSION'S ROLL OF HONOR.

By W. R. Ellis, Secretary.

When this country declared war against Germany in April, 1917, there were on the staff pay roll of the California Highway Commission 279 men and 21 women. How badly this organization was disrupted may well be imagined when it is understood that by the close of the war 188 of these original employees, and of those hired to fill vacancies, had joined the army. In one division where the initial pay roll numbered 33 names, a total of 40 men enlisted or were drafted.

The losses among the day labor forces were likewise heavy, particularly in superintendents, foremen, and skilled mechanics. At times it was very difficult to maintain even a minimum working organization.

Of those whom the California Highway Commission released to the army and navy, three qualified as majors, sixteen as captains, fourteen as first lieutenants, twenty-one as second lieutenants, one as master engineer, twenty as sergeants, eight as corporals, and one as ensign. Eighty of the men joined engineer regiments, many of them being in combatant or ''pioneer'' companies. Twenty-six entered the air service, fifteen the artillery, eleven the infantry, six the navy, three the medical corps, and three the marines.

Eight golden stars on the service flag of the commission tell of the sacrifice made by some of these men. B. E. Patterson, a clerk, left early and went to the front. He fell as he was going ''over the top.'' L. B. White, an instrumentman with the commission, serving overseas with the quartermaster's corps, also fell in action. H. G. Collins, a rodman, training at Camp Lewis; Leon L. Clarke, a resident engineer, commissioned first lieutenant Co. 3, E. O. T. S.; W. H. Hanvey, a clerk, a corporal in the air service; R. R. Hatchett, a resident engineer, serving as first lieutenant with the 403d Engineers; and L. E. Jenkins, a chainman, and H. E. White, a rodman, both privates, all died of sickness while in training. The commission deeply feels the loss, but it glories in their heroic spirit.

The commission is proud indeed of its men in war service, and will welcome their return.

Following is the roll, complete in so far as the data have been available to the department:

CALIFORNIA HIGHWAY COMMISSION ROLL OF HONOR.

Name	Occupation	Division	Grade	Branch
Araujo, E. A.	Rodman	III	Private	Engineers.
Andrews, W. J.	Draftsman	IV		23d Engineers.
Anderson, Clay	Resident engineer	IV	Major	2d Engineers.
Avery, H. T.	Draftsman	V	Captain	1st Engineer Replacement Regiment.
Armstrong, Floyd	Asst. accountant	Hdqrs.	Sergeant	Quartermasters Corps.
Argall, Clarence B.	Draftsman	IV	Private	Quartermasters Corps.
Argall, Robert W.	Rodman	III	2d lieutenant	Infantry.
Albert, Leo A.	Stenographer	V	Sergeant	Quartermasters Corps.
Bass, Benonia	Chainman	II	Private	319th Engineers.
Barnum, Leo	Rodman	VI	Private	—
Baillie, D. G., Jr.	Instrument man	II		115th Engineers.
Baber, W. F.	Rodman	V	Private	—
Barber, J. F.	Transit man	I	1st sergeant	23d Engineers.
Belknap, F. R.	Instrument man	II	Private	Co. B, 23d Engineers.
Balsz, H. F.	Rodman	III	Private	—
Blackburn, T. R.	Rodman	IV	Private	—
Bowen, N. J.	Draftsman	IV	1st lieutenant	23d Engineers.
Baker, R. L.	Truck driver	VI	Private	Infantry.
Bartell, H. W.	Chief of party	III	Private	Co. 1, E. O. T. S.
Bertaud, Lloyd	Axman	VI		Air Service.
Baker, C. C.	Timekeeper	I	1st sergeant	Quartermasters Corps.
Brown, H. T.	Resident engineer	IV	Private	43d Engineers.
Brett, G. M.	Axman	I		—
Bigelow, H. T.	Rodman	II		Quartermasters corps.
Beuthel, R. L.	Draftsman	VI	Private	Canadian 18th Training Battalion.
Brannan, J. H.	Instrument man	II		Quartermasters Corps.
Beard, A. A.	Instrument man	IV	2d lieutenant	—
Brilley, Howard	Chief of party	III	1st lieutenant	Co. 3, E. O. T. S.
Breuning, O. D.	Instrument man	II	Private	37th Field Artillery.
Compton, W. W.	Instrument man	I	Corporal	347th Field Artillery.
Coburn, H. A.	Rodman	II	Private	Quartermasters Corps.
Collins, H. G.*	Rodman	II		Camp Lewis.
Craddock, A. R.	Chainman	II		—
Cole, A. T.	Asst. superintendent	VI	1st lieutenant	Air Service.
Crowell, Geo. W.	Chief of party	II	2d lieutenant	117th Engineers.
Cummings, L. W.	Resident engineer	VII	Captain	23d Engineers.
Clay, J. H.	Foreman	VII	Corporal	363d Infantry.
Calavan, P. C.	Instrument man	II	Private	Co. D, 41st Engineers.
Chase, W. H.	Draftsman	II	Master engineer	115th Engineers.
Christy, W. J.	Draftsman	IV	Private	20th Engineers.
Coonrod, Almon	Instrument man	VI	Private	20th Engineers.
Crespo, S.	Rodman	II	Private	—
Crouch, K. W.	Chainman	VII		—
Clair, C.	Foreman	VII	Private	319th Engineers.
Carbee, G. W.	Draftsman	VII		Air Service.
Comly, H. S.	Asst. division engineer	II	Private	Air Service.
Clarke, Leon L.*	Resident engineer	IV	1st lieutenant	Co. 3, E. O. T. S.
Cuff, R. E.	Laborer	II		Bat. A, 143d Field Art.
Darling, H. C.	Resident engineer	III	1st lieutenant	20th Engineers.
Daily, W. T.	Draftsman	V	Private	23d Engineers.
Dunshee, B. K.	Draftsman	V	Captain	316th Engineers.
Dron, John	Rodman	VI	2d lieutenant	Co. A, 37th Machine Gun Battalion.
DeCew, Llewellyn	Chainman	IV	2d lieutenant	—
Davis, Harry B.	Asst. resident engineer	VI		Air Service.
Davidson, J. B.	Draftsman	II	Sergeant	20th Engineers.
Dingle, C. O.	Instrument man	II	Private	—
Dyer, F. C.	Instrument man	VI	Sergeant	—
Dias, Joe A.	Asst. resident engineer	V	1st lieutenant	—
Duffy, W. T.	Rodman	II		—
Dunham, Ray	Rodman	I	Private	13th Infantry.
Ennis, Chas. M.	Draftsman	IV	2d lieutenant	—

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*Died in the service of their country.

CALIFORNIA HIGHWAY COMMISSION ROLL OF HONOR—Continued.

Name	Occupation	Division	Grade	Branch
Epperly, F. C.	Foreman	V	Private	Coast Artillery.
Evans, L. C.	Rodman	II	1st sergeant	Air Service.
Eastman, Phillip	Rodman	V		Marine Corps.
Ellis, W. D.	Chief of party	IV	1st lieutenant	4th Engineers.
East, E. E.	Asst. Division Engineer	VII	Captain	403d Engineers.
Fenton, J. H.	Draftsman	III	Ensign	Navy.
Flood, T. B., Jr.	Draftsman	IV		Naval Air Service.
Finch, R. D.	Rodman	II		63d Infantry.
Granger, Earle G.	Chainman	VI	2d lieutenant	—
Gronlund, Carl	Asst. resident engineer	VI		—
Gretlein, E. A.	Patrolman	VI	Sergeant	23d Engineers.
George, A. N.	Chief of party	VII	1st lieutenant	Air Service.
Guyot, Stanley	Chainman	VII		Navy.
Greene, J. D.	Superintendent	IV	2d lieutenant	43d Engineers.
Godfrey, D. E.	Draftsman	VII	Captain	Co. 4, E. O. T. S.
Gardner, E. D.	Instrument man	I		—
Gregg, John L.	Foreman	VII		—
Greene, C. H.	Rodman	II		Quartermasters Corps.
Gifford, L. D.	Asst. resident engineer	VII		Artillery.
Gilroy, U. B.	Draftsman	I		F. A. O. T. S.
Greer, W. W.	Rodman	III	Private	S. A. T. C.
Hellesoe, Geo. F.	Transit man	I		—
Henry, B. H.	Chief of party	II		Air Service.
Hanvey, W. H.*	Clerk	III	Corporal	Air Service.
Haskett, V. L.	Chainman	I	Corporal	316th Engineers, 91st Div.
Halbedl, R. J.	Draftsman	I		—
Halter, Regis	Chainman	II	Private	—
Haviland, J. T.	Superintendent	II	Sergeant	23d Engineers.
Hawthorne, T. J.	Instrument man	II	Sergeant	316th Engineers.
Hewitt, F. C.	Chief of party	III	Private	23d Engineers.
Hughes, R. L.	Draftsman	III	Captain	117th Engineers.
Hampton, Geo.	Instrument man	III	2d lieutenant	Engineers.
Hancock, C. A.	Foreman	III	Private	—
Haines, H. S.	Draftsman	IV	Private	—
House, Frank M.	Draftsman	IV	1st lieutenant	—
Herbage, W. J.	Draftsman	V	Private	Medical Corps.
Hutchins, R. D.	Axman	VII	Private	Air Service.
Harper, E. G.	Superintendent	III	Captain	Air Service.
Hodges, J. M.	Chainman	VII	Lieutenant	Engineers.
Hawkins, C. E.	Laborer	V	Private	Coast Artillery.
Hamaker, C. M.	Asst. resident engineer	V		Navy.
Hilby, Geo. R.	Draftsman	Hdqrs.	2d lieutenant	Air Service.
Hodges, J. B.	Instrument man	IV	2d lieutenant	—
Henry, Hugh	Foreman	VII	Private	—
Herring, Ed L.	Rodman	V	Truck driver	Quartermasters Corps.
Henry, A. R.	Patrolman	VI	Corporal	23d Engineers.
Hatchett, R. R.*	Resident engineer	III	1st lieutenant	403d Engineers.
Haverstick, R. M.	Chief of party	VII		Artillery.
Holt, Frank	Chainman	I		—
Houston, Harold	Foreman	II		Co. B, 12th Infantry.
Irish, A. C.	Rodman	III		Air Service.
Irish, W. H.	Chainman	III		Air Service.
Judkins, W. L.	Asst. resident engineer	V	Private	23d Engineers.
Johnson, W. H.	Chief of party	II	1st lieutenant	Co. 1, E. O. T. S.
Jenkins, L. E.*	Chainman	VII	Private	—
Kohner, O.	Instrument man	II		—
Keys, Wm. J.	Draftsman	IV	Captain	Quartermasters Corps.
Knapp, L. J.	Truck driver	III	Private	—
Kinyon, Carl	Rodman	II	Private	72d Infantry.
Lewis, W. D.	Instrument man	II	2d lieutenant	—
Lowden, P. R.	Rodman	II	Private	23d Engineers.
Luttrell, J. C.	Rodman	V	2d lieutenant	Air Service.
Layman, H. L.	Asst. resident engineer	V	Private	23d Engineers.
Larkin, M. F.	Rodman	III	Private	Marine Corps.
Lanzendorf, O. W.	Resident engineer	IV	2d lieutenant	43d Engineers.
Langtre, L. F.	Clerk	VII	Captain	Quartermasters Corps.
LaForge, E. C.	Chainman	VII	Private	Medical Corps.
Massa, Frank	Foreman	II	Sergeant	20th Engineers.

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*Died in the service of their country.

CALIFORNIA HIGHWAY COMMISSION ROLL OF HONOR—Continued.

Name	Occupation	Division	Grade	Branch
McCush, J. E.	Rodman	I	Private	319th Engineers.
Millard, B. T.	Asst. resident engineer	III	Private	Co. 3, E. O. T. S.
Miller, C. H.	Mechanic	III	Mechanic	Air Service.
McEwen, A. R.	Instrument man	III	Private	Air Service.
McKeever, Geo. V.	Rodman	II	Private	Engineers.
McNeeley, Geo. E.	Draftsman	III	Private	23d Engineers.
McAndrew, S.	Rodman	V	Private	144th Field Artillery.
Mitchell, D. H.	Rodman	V	Private	Air Service.
Mack, Geo.	Rodman	VI	Private	18th Railroad Engineers.
More, J. C.	Resident engineer	VII	Captain	Engineers.
Marshall, L. G.	Asst. resident engineer	V	Sergeant	20th Engineers.
Mason, W. A.	Resident engineer	III	Major	117th Engineers.
McLennan, G.	Rodman	II	Private	20th Engineers.
McMains, F. L.	Rodman	IV		Navy.
Mahon, John	Asst. resident engineer	VI	Private	———
McMillan, F. C.	Draftsman	VII	Captain	Co. I, E. O. T. S.
Merritt, F. C.	Chief of party	V	Private	1st Engineers Replacement Regiment.
Malm, Geo.	Rodman	VI	2d lieutenant	———
Nelson, LeRoy	Draftsman	III	Private	Ambulance Service.
Nielsen, Fred	Draftsman	III	Sergeant	316th Ammunition Train.
O'Connell, M. J.	Rodman	II		———
O'Shaughnessy, T.	Timekeeper	II	Private	Air Service.
Odett, Joe	Rodman	II		49th Co., 13th Bat., 166th Depot Brigade.
Parker, R. N.	Asst. resident engineer	VII	Mechanic	Air Service.
Peery, W.	Asst. resident engineer	I	Sergeant	23d Engineers.
Porter, C. O.	Rodman	II	Sergeant	———
Patton, R. D.	Chainman	V	Sergeant	Coast Artillery.
Peck, R. S.	Foreman	V	Corporal	Infantry.
Peters, A. A.	Asst. division engineer	V	Major	23d Engineers.
Powell, Russel	Axman	VII	Private	Artillery.
Patterson, B. E.*	Clerk	II	Private	116th Engineers.
Price, W. J.	Rodman	I	Private	319th Engineers.
Paul, E. S.	Clerk	VII	Corporal	50th Engineers.
Patterson, H. C.	Truck driver	VI	Private	91st Infantry.
Pierce, R. E.	Office engineer	III	1st lieutenant	Co. 3, E. O. T. S.
Parks, R. N.	Asst. resident engineer	VII	Private	Navy.
Potter, C. A.	Instrument man	I	Private	472d Engineers.
Reupke, H. T.	Rodman	VI	Corporal	———
Roberts, E. W.	Draftsman	III	2d lieutenant	———
Rampone, L. F.	Rodman	V	Private	Air Service.
Rosenberg, C. M.	Rodman	VI	Private	117th Engineers.
Rice, W. L.	Foreman	VII	Private	———
Reilly, W. H.	Truck driver	VII	Truck master	———
Richards, C. O.	Instrument man	VI	Private	115th Engineers.
Roth, L. E.	Truck driver	II	Private	319th Engineers.
Sanson, T. A., Jr.	Chainman	VII	Private	143d Field Artillery.
Stover, Harvey	Draftsman	III	Sergeant	Ordinance Depot.
Scott, E. T.	Asst. superintendent	VII	2d lieutenant	23d Engineers.
Strickland, C. C.	Rodman	VII	Private	Artillery.
Saul, C. M.	Draftsman	Hdqrs.	2d lieutenant	Canadian Engineers.
Sapp, D. N.	Instrument man	I		———
Simmins, H. C.	Asst. resident engineer	IV	Private	12th Infantry.
Seymour, L. W.	Laborer	III	Sergeant	Artillery.
Scott, Harold	Chainman	VII	Private	———
Schumacher, E. M.	Rodman	I	Private	Marine Corps.
Stuckey, A.	Truck driver	VII	Private	———
Seitz, E. L.	Instrument man	II	Wagoner	Co. A, 316th Ammunition Train.
Tremper, R. A.	Instrument man	II	Private	23d Engineers.
Thomas, F. M.	Axman	II		———
Tandy, Wm. B.	Chainman	III	Seaman	Navy.
Taylor, D. B.	Asst. resident engineer	IV	2d lieutenant	———
Turner, M. M.	Instrument man	IV	2d lieutenant	Air Service.
Thompson, C. H.	Chainman	V	Private	Medical Corps.
Taylor, W. B.	Asst. resident engineer	V	Private	———
Taylor, L. H.	Superintendent	II	Captain	42d Engineers.

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*Died in the service of their country.

CALIFORNIA HIGHWAY COMMISSION ROLL OF HONOR—Concluded.

Name	Occupation	Division	Grade	Branch
Turner, R. L.	Rodman	II	Private	166th Depot Brigade.
Thurston, C. M.	Chainman	VII	Private	————
Vogliotti, P.	Subforeman	V	Private	Air Service.
Varain, C. A.	Foreman	III	Private	Ordnance Department.
Walther, L. H.	Draftsman	II	Private	Naval Res. Air Service.
White, L. B.*	Leveler	I		Quartermasters Corps.
White, J. G.	Rodman	I		Air Service.
Weeks, C. H.	Chainman	III	Private	18th Engineers.
Welch, E. A.	Instrument man	III	Captain	113th Engineers.
Wallace, J. G.	Clerk	V	Captain	Quartermasters Corps.
Wason, T. F.	Rodman	V	2d lieutenant	Engineers.
White, J. J.	Resident engineer	VI	Private	316th Engineers.
Wheeler, F. S.	Instrument man	VI	2d lieutenant	115th Engineers.
Wyatt, Victor	Steam roller engineer	III	1st sergeant	117th Engineers.
White, F. D.	Asst. resident engineer	I	Private	319th Engineers.
Wiley, Arthur R.	Rodman	V		————
Weeks, G. W.	Rodman	I	Private	319th Engineers.
Wanzer, J. O.	Chief of party	III	1st lieutenant	47th Engineers.
Wallace, A.	Instrument man	III	Private	————
Wood, Geo. L.	Truck driver	VI	Private	O. A. C. Training Det.
Wagner, A. J.	Asst. engineer	Hdqrs.	Captain	Co. 3, E. O. T. S.
Wegner, W. W., Jr.	Rodman	II		————
Woodin, C. F.	Draftsman	II	Private	Co. A, 1st Replacement Regiment.
White, H. E.*	Rodman	IV	Private	23d Engineers.
Zeigler, R.	Truck driver	VI	Private	————

*Died in the service of their country.

APPENDIX B.

REPORT OF HIGHWAY ENGINEER TO CALIFORNIA HIGHWAY COMMISSION.

December 15, 1918.

California Highway Commission,
Sacramento, California.

GENTLEMEN: The active construction work of the commission began in the spring of the year 1912 so that at this date seven years have elapsed during which the state highways have been building.

The work has gone haltingly at times because of the lack of funds, and other obstacles, but on the whole the years have been active and much has been done.

In the biennial report now in preparation will be printed tables in considerable detail indicating the accomplishments of the commission, and in the appendices special articles will be included showing how the work is conducted.

This report, therefore, will be limited mostly to the discussion of types of work and general features.

Widths of Right of Way.

Nearly all of the state highways have rights of way at least 60 feet in width although there are a few miles where 40- and 50-foot widths were all that could be secured without an unwarranted delay which would ensue were litigation resorted to.

The 60-foot width appears to be ample under the present conditions.

Unlike some of the Eastern states, California has generally required the electric railways to secure private rights of way and they do not have to be provided for within the highway location, but telephone lines are frequent, and to some extent, power lines.

The high voltage lines along some of the roads are more or less of a menace to the public but, especially in the more thickly settled parts of the state, it is difficult to see how the cities can be lighted and the power used for manufacturing without permitting the electric companies to use the highways for their poles and lines.

The commission has always tried to adjust the grades of its roads so as to avoid unsightly borrow pits but sometimes the borrow pits are unavoidable in the valleys where the country is flat and the roads must be turnpiked to keep them above the general level in wet weather. In such cases it is usual to secure more than 60 feet of right of way so that sufficient earth may be available to throw up the grade without making too deep pits alongside.

Cross Sections.

The cut on page 49 shows the typical sections used in the work of the commission, the sections being self-explanatory.

On most of the paved work the concrete has been laid to a width of 15 feet with shoulders on each side not less than 3 feet in width, but in certain localities where the traffic is greater, notably on the road down the Peninsula south of San Francisco in San Mateo and Santa Clara counties, the pavement has been laid to a width of 24 feet at the northerly end and 20 feet at the southerly end, a few miles south of San Jose.

In the open country the 15-foot pavement seems to be adequate for the traffic but in many places, as the roads approach the cities, it has already been necessary to construct the shoulders of broken stone or concrete to provide for the constantly increasing traffic.

Mountain laterals which have not been paved have been graded to various widths, depending upon the importance of the roads, but as a rule a minimum width of 16 feet has been required.

This width is none too great for any road in the mountains but the commission has been compelled, because of the great cost of grading in some localities, to construct the roadway at a lesser width than it would like.

On sharp curves in the mountains the road has always been graded wider for the sake of safety and in such places as the road could be widened without greatly increased cost, the widening has been made notwithstanding the general width of the grading adopted.

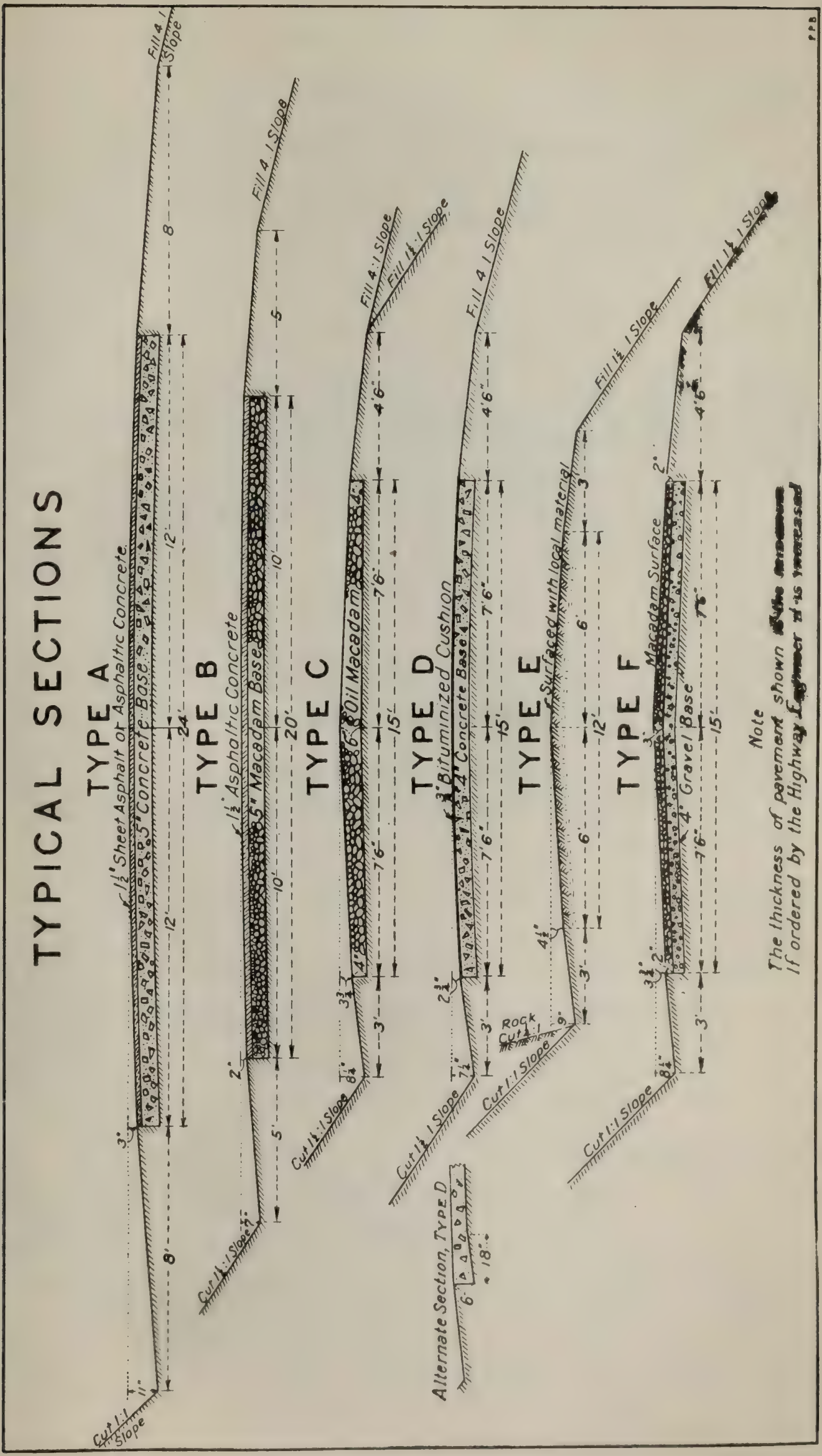
Superelevation.

There is much demand by motorists for the superelevation of the roads on curves, or in other words, the construction of one side of the road at a higher elevation than the other so that vehicles may go around curves with greater speed and less danger of overturning.

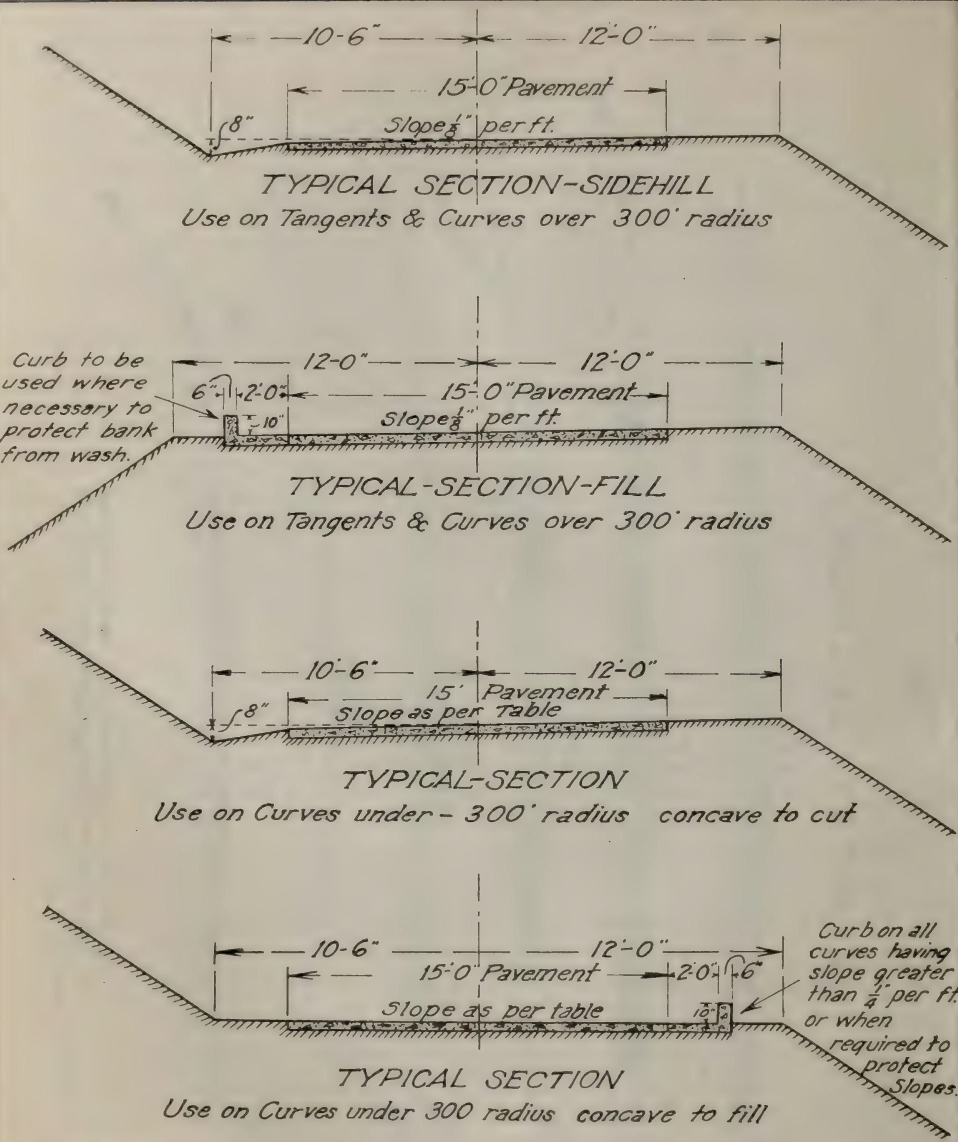
There are at least two phases of this question worth discussing.

In the valleys and on moderate grades the commission has done but little of this kind of work. In no case outside of the towns and villages has any curve been constructed around which it is not safe to drive at the rate of 30 miles per hour, the maximum speed which the vehicle law of the state permits under any circumstances. Fifteen miles per hour is as fast as a machine ever should be operated under any conditions where the view of the traffic is obstructed.

It is notorious, however, that on the smooth surfaced roads constructed by the commission the vehicles are often operated at a much greater rate of speed than the law sanctions. Whether or not these excessive speeds can be controlled is doubtful but up to the present time comparatively little effort has been made by the local authorities to keep the speed down to the rate permitted by the law, especially in sparsely-settled localities.



TYPICAL SECTIONS



TYPICAL SECTION-SIDEHILL

Use on Tangents & Curves over 300' radius

TYPICAL-SECTION-FILL

Use on Tangents & Curves over 300' radius

TYPICAL-SECTION

Use on Curves under - 300' radius concave to cut

TYPICAL SECTION

Use on Curves under 300 radius concave to fill

TABLE OF CROSS SLOPES

Radius of Curve	Slope
50' to 75'	3/4" Per ft.
75' to 100'	1/2" " "
100' to 150'	3/8" " "
150' to 225'	1/4" " "
225 to 300'	1/8" " "

STATE OF CALIFORNIA
DEPARTMENT OF ENGINEERING

CALIFORNIA HIGHWAY COMMISSION

TYPICAL ROAD SECTIONS

TO ACCOMPANY GENERAL
INSTRUCTIONS # 355

Scale 3/16' = 1 July 25, 1917.

JMF

It is probable that at the present time at least 95 per cent of the traffic over the rural highways in California is motor-driven.

A superelevated road is not needed by or adapted to horse-driven traffic but since there is so little of that sort of traffic at the present time it may be almost omitted from this consideration.

It is possible that in the future, recognizing the practical impossibility of rigidly enforcing the speed laws, the commission will be forced to superelevate the roads on all curves of less than, say, 250 feet radius.

The other phase of the question that should be discussed is the treatment of the roads in the mountains, both on curves and on tangents. There it is not so much a question of speed as of safe operation when the roads are slippery.

The commission has many miles of road, some paved and some unpaved, where side-slipping off the road means certain death to the occupants of the vehicle. The wooden guardrails frequently erected at especially dangerous points are safeguards more imaginary than real in value. They warn the driver to keep away from the edge of the bank but if the machine skids against the guardrail, while the fence may retard the motion and often stop the machine, it should not be relied upon too much.

In a tentative way to make these roads safer, the following instructions were issued in 1917 to the division engineers of the commission. The typical sections referred to are shown on the cut on page 50:

Concrete Pavements on Mountain Roads.

Attached hereto is a blue print showing typical sections for concrete pavements on mountain roads.

These sections are to be considered as more or less tentative, but they will govern until further orders.

While the sections show only fifteen-foot pavements, with suitable modification, they will be used for greater or lesser widths when the approved plans so indicate.

On tangents and curves with radii over 300 feet, the pavement will slope downward toward the cut bank at the rate of one-eighth an inch per foot, regardless of the direction of the curve.

Where a tangent has fill slopes on both sides, the slope will be downward toward the more suitable side for drainage.

Where a curve has fill slopes on both sides, the pavement inclination will be downward toward the concave side.

The pavement on curves with radii less than 300 feet will slope downward toward the concave side, the rates of slope being as follows:

(*a*) For radii of 75 feet or less, ¾ inch per foot;
(*b*) For radii of 75 feet to 100 feet, ½ inch per foot;
(*c*) For radii of 100 feet to 150 feet, ⅜ inch per foot;
(*d*) For radii of 150 feet to 225 feet, ¼ inch per foot;
(*e*) For radii of 225 feet to 300 feet, ⅛ inch per foot.

A concrete curb, six inches wide on top and with an exposed face ten inches in height, will be placed at the outer edge on curves where the pavement inclines downward toward the fill slope at a rate in excess of one-fourth inch to the foot. Curbs will not be placed on tangents nor on curves unless the slope of the pavement is greater than one-fourth inch to the foot except where it is necessary to protect a fill slope from wash and then only upon specific authority from the Highway Engineer. Wherever curbs are installed suitable openings for drainage

> must be provided, together with proper protective devices against discharge through such openings.
>
> Pavements having a normal width of less than 18 feet will be widened two feet on the concave side on curves of 150 feet radius or less, the length of such crescent shaped widenings being limited by the natural "track" of the traffic. Two feet of extra width will be placed also at other points where curbs are installed on pavements less than 18 feet wide.
>
> The transition between curved sections and tangent sections will ordinarily be made in a length of 30 feet, one-half on the curve and one-half on the tangent, but the transition between reverse curves having pavement slopes of more than one-fourth inch per foot may be made longer up to a maximum of 50 feet.
>
> Tangents less than 100 feet long connecting curves on which the slope is toward the fill will be considered exceptional cases and the pavement will slope toward the fill at the rate of one-eighth inch per foot.

These instructions, already spoken of as tentative, are probably too conservative and it is likely that they will be succeeded by others providing for greater degree of superelevation.

It has been found that roads built in accordance with these instructions offer no difficulty in driving and the driver has a feeling of safety which is absent on the center crowned road.

Types of Work.

No other state highway department in the United States has dealt with a greater variety of road than has the California Highway Commission. Included in the list are the mountain roads in the Sierra, built under special legislative appropriations; the carefully-engineered graded roads in the mountainous parts of the state which the commission has built under the state highways acts; the water-bound macadam type with surface application of asphaltic oil; the concrete base type with and without the carpet covering of bitumen and stone screenings; the broken stone base type with Topeka mixture tops; the concrete base with sheet asphalt and Topeka tops; and the so-called bituminous macadam roads, some built by the commission but mostly by the counties and afterwards taken over by the state.

The underlying philosophy of the work has been to avoid waste. The commission has in all cases attempted to build the road to suit what it thought was the need of the traffic, making reasonable allowance for the increased traffic which an improved road always attracts to itself.

Graded Roads.

In the mountains the grading is always expensive and the traffic relatively less than in the valleys. For these reasons, save in certain cases, the mountain roads built by the commission have not been paved. This is not universally true since in the case of the Ridge Route in Los Angeles County, on the main road from Bakersfield to Los Angeles, the traffic is so great that nothing but a well paved road will serve.

It is also expected that some other portions of the main routes, notably in the Sacramento River Canyon and between Willits and

Eureka, will require paving within a very few years to make them really serviceable.

The graded roads have been planned carefully; all the culverts and drains needed have been installed, and in fact, in all particulars except the lack of paving they are as good as the rest. On no main route of travel is the grade in excess of 7 per cent, and on the laterals 8 per cent has been fixed as the maximum.

On curves the grades have been compensated, the roadway widened, and the radii limited to 50 feet although so short a radius is a rarity. In the later work the mountain grades have been "superelevated" always on the curves and sometimes on the tangents as well.

Water-Bound Macadam With Surface Application of Asphaltic Oil.

In an attempt to minimize the first cost of the work on two stretches of road, one in El Dorado County and one in Mendocino County aggregating about 10 miles in length, the commission in the early years tried the water-bound macadam road with surface application of asphaltic oil.

The traffic on both roads is relatively light and the roads have lasted fairly well with moderate maintenance costs, but it is apparent that for general use with average traffic such roads would not be practicable in these days.

Bituminous or Oil Macadam (Penetration Method).

In the early days of the work some 30 miles of bituminous macadam roads were built, chiefly to influence the cement companies to be reasonable in their bids on their products. The commission has also taken over from the counties about 166 miles of roadway so constructed.

Where the traffic is not too heavy and the pavement is well built these roads have given good service and were it not for the fact that almost without exception after four or five years of use under modern traffic conditions such roads become wavy and develop corrugations like a washboard, the commission would doubtless have built a greater mileage of this type since they are cheaper to construct than the concrete base roads.

The bituminous macadam roads taken over from the counties have all reached the period when the corrugations develop rapidly and the maintenance of these roads is a difficult problem and the cost excessive. One of the much traveled roads in Los Angeles County, now maintained by the state, is said to have cost the county in excess of $800 per mile per year to maintain it. The state has surely spent as much as that per year since it assumed the burden.

Perhaps the best example of this type of road which the commission can show is in Madera County between Califa and Madera, a stretch of nearly 10 miles. This road was completed in October, 1913; it has cost little for maintenance; and has few corrugations.

Concrete Bases.

The commission has more than 1,000 miles of concrete base road of which more than 600 miles have been covered with the thin bituminous tops or carpets.

This type of pavement may be called the ''standard'' of the commission and is worthy of a detailed description.

The concrete base is generally 15 feet in width and of a minimum thickness of 4 inches. Where necessary, the roadway has been often further widened by 3-foot macadam or gravel shoulders on each side of the pavement, making the hard surfaced roadway 21 feet in width.

The thin bituminous wearing surface is about one-half an inch in thickness and is composed of heavy asphaltic road oil and screenings. Except under very heavy traffic conditions, this surfacing has proved satisfactory in protecting the concrete pavement from wear.

Grading.

The specifications for excavations and embankments require the removal of all trees, stumps, roots, and vegetation within the roadbed and slopes as directed by the Engineer, the removal of all soft or unsuitable material and, where required, the refilling with good earth or gravel.

Embankments are made of suitable material carried up for the full width in layers not to exceed one foot in thickness and the teams are made to travel as evenly as possible over the whole surface of each layer, both going and coming. All hard lumps or clods are required to be broken before being placed on the embankments.

After the excavations and embankments are made, the entire width of roadway is thoroughly watered and rolled with a roller weighing not less than 200 pounds per inch width of tire until the surface is smooth and unyielding.

Cement.

All cement used is required to meet the specifications of the American Society for Testing Materials. It is purchased in large quantities and a tested stock is kept at the different mills to be drawn on as needed for the work.

Fine and Coarse Aggregates.

The sand or fine aggregate used for the concrete construction is tested for its strength in compression and tension in a 1:3 mortar and this strength reported in comparison with Standard Ottawa sand mortar made up of the same brand of cement at the same time. The sands acceptable for the concrete highways are required to show a mortar strength at least 100 per cent of the strength shown by the Standard sand mortar. In the grading test the sands are required to have at least 50 per cent and not more than 85 per cent retained on a 30-mesh sieve.

The coarse aggregate used for the concrete pavement is sound gravel or broken stone clean and free from foreign matter and of uniform grading from ¼ inch to 2½ inches. The abrasion test is made on crushed rock samples and a coefficient of wear of 9 is the minimum that has been acceptable. On a few isolated sections of the system where local supplies of rock were the only possible sources at a cost within reason, rock having a coefficient of wear of 7.5 to 8 has been used. These supplies of rock were not a mixture of hard and soft material but were of a uniform hardness and have given satisfactory pavements.

The concrete is made up of measured quantities of cement, fine and coarse aggregate in a ratio of 1:2:4.[a] Prior to the letting of a contract the sand and rock proposed for use are tested for compressive strength in a 1:2:4 mix and at the end of 28 days a strength of at least 2,000 pounds per square inch is acceptable.

Before the pavement or shoulder material is placed, the roadbed is graded to a true cross-section conforming to the proper grade called for in the plans and this thoroughly watered and rolled until the surface is smooth and unyielding. When a uniform and unyielding surface can not be otherwise obtained, the surface is cultivated and again puddled with water and rolled until a true and firm foundation is secured.

The subgrade has the same crown as that of the concrete pavement. The pavement is required to be of a minimum thickness of four inches. In some sections of California there is a heavy black clay soil known as adobe; it is generally the alluvial deposit of decomposed basic lava. This adobe soil has a very high shrinkage upon drying and where such a subbase exists it will shrink away from the concrete pavement and would support possibly only the center of the pavement. The 4-inch concrete is not thick enough to resist breaking in long longitudinal cracks under these conditions and it has generally been the practice in building over adobe regions to thicken the pavement or reinforce it to prevent longitudinal cracking.

Placing the Concrete.

Planks 2″ by 4″ placed on edge and securely nailed to the inside of supporting stakes are used for headers on each edge of the pavement. These headers are of a good grade of timber and great care is taken where one header joins the next so that the upper surface is a true smooth line. The tamping templets ride on the headers and any irregularities in the surface of the headers will produce a mound or hollow in the finished pavement that is not likely to be removed by the floats or other instruments used to finish the surface of the concrete.

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[a] Prior to the year 1917 the mixture used was somewhat leaner. It was called 1:2½:5 but had somewhat more cement than those proportions indicate.

Prior to the placing of the concrete the subgrade is checked by means of a heavy wooden templet which rides the headers and has at 6-inch intervals spikes set true to the crown of the roadway and of such a length that any of the subgrade more than $\frac{1}{8}$-inch too high will be scratched. In this way the minimum thickness of 4 inches of pavement is practically assured, by the subsequent use of proper tamping templets on the concrete.

The concrete pavement is laid on the damp subgrade. It is tamped with heavy crown grade tampers, which tampers, when resting on the header boards, fit the crown of the finished road. After the concrete has been tamped to the designed shape the surface is finished by means of wooden floats. Any little imperfections in the surface can be remedied by the man handling the finishing float.

The concrete is mixed with just enough water to produce a jelly-like consistency. The desired amount of water produces a mixture that is plastic and will readily flush with light tamping, but which can be handled without causing a separation of the fine aggregate from the coarse.

The concrete materials are required to be in the mixing machine for at least one minute and to receive at least ten complete revolutions after all of the ingredients are in the machine, and the maximum speed of the drum not to exceed sixteen revolutions per minute.

After the concrete pavement is placed it is kept damp by sprinkling during the first twenty-four hours and then cured under water for ten days. The road is checked by low earthen dams into a series of shallow reservoirs from twelve to fifteen feet square. These reservoirs are kept filled with water for ten days. This method of curing has been very satisfactory, as it is sure, and also the curing can be so easily inspected. The pavement is protected from traffic for one month after laying.

The Thin Bituminous Wearing Surface.

The road oil used for this surfacing is of an asphaltic base and contains approximately 90 per cent of 80° penetration asphalt. In California the road oil companies classify this product as a "90-80" road oil. This method of classifying the oil does not, however, insure like physical properties for oils from different companies or from different oil fields. Two oils, both containing the same percentage of 80° penetration asphalt, may show very different physical properties. One may be so viscous it is a semisolid substance at ordinary temperatures, while another may be of such viscosity that it will be liquid.

One oil may be sticky or cementing, while the other may be lubricating in its action.

In the building of the thin bituminous wearing surface for concrete pavements two physical properties of the road oil are of greatest importance. The oil must be of such a viscosity that when applied to the road it will readily combine with the screenings that are thrown upon its surface. A very viscous oil will form a hard surface and the screenings will not be absorbed and to a large extent be thrown off the road by the passing traffic. Only a small amount will settle or be forced into the oil. Such an oil will not build up a satisfactory protecting wearing coat.

The road oil must also be cementing or adhesive so that it will stick tightly to the concrete surface and bind together all of the fragments of stone screenings. It should be an active cement, and if it is not sticky then the wearing surface will not be firm enough to resist the push and pull of the passing traffic.

All road oils submitted for this type of surfacing are tested for viscosity and adhesiveness, and must show in these two physical tests that they fall within the limits specified. The oils are also tested for percentage of asphaltic volatility, flash and burning point, specific gravity, and solubility in the usual solvents.

The oldest thin bituminous surfacing laid by the California Highway Commission has been under traffic for more than five years on the main San Joaquin Valley highway just north of Fresno. This surfacing has in this length of time required little attention, and today, while it shows its age, it still has a year or two more of useful life.

The use of the heavy asphaltic road oil in this type of construction has produced a wearing surface in which the cementing material is very much "alive." It readily mends if cut or broken.

The thin bituminous wearing surface is about half an inch in thickness when completed. After it has been under traffic for a few months it is found to contain a fairly uniform mixture of mineral aggregate and bituminous binder consisting of about 8 per cent to 11 per cent of bitumen and the balance mineral aggregate of a fairly uniform grading running from dust to rock of one-half inch maximum diameter. This surface looks much like sheet asphalt, is firm under traffic and gives good traction. It shows little or no tendency to flow or creep and the surface remains true and free from rolling. The concrete base, however, must be finished with a true, smooth surface to make a good riding highway, as this type of surfacing is not thick enough to smooth up to any considerable extent a concrete pavement whose surface is uneven.

The procedure in laying this thin wearing surface is as follows: First, the surface of the concrete is cleaned of dirt, dust films and any thin coat of laitance. This is best accomplished by opening the bare concrete to traffic for a month or two. The ironshod traffic and the rapidly-moving rubber tires are of greatest help in breaking any weak layers of dirt or laitance and exposing the surface of the concrete proper. This "traffic cleaning" is followed by brushing with revolving street brooms and hand brooms. In some cases a flushing of the surface with water is a help in washing off any thin coat of clay. It is of greatest importance that the asphaltic oil bind to the solid concrete and not to any overlying weak film of dirt. The care taken in getting a clean concrete is without doubt in a large measure responsible for the success of this surfacing because of the strength of the bond between the concrete and the bituminous wearing coat.

After the concrete has been cleaned the asphaltic oil, at a temperature of from 250° to 500° Fahrenheit, is applied by a pressure distributor at the rate of one-fourth of a gallon per square yard. This oil surface is immediately covered by a layer of mineral aggregate, either crushed rock screening or fine gravel of a maximum diameter of one-half inch and a minimum diameter of about one-eighth inch. This material may contain some fines and dust, but should be a fairly clean material.

The screenings are applied by shoveling from piles placed at frequent intervals alongside of the road. The shovelers can be taught to so throw the screenings that they will cover the road surface with a fairly uniform thickness. The road can now with advantage be given a light rolling, but this is not necessary. Any excess of screenings should be swept into piles alongside of the road, to be used on the second application of road oil. This is applied to the road at the same rate as before, one-fourth of a gallon per square yard, and is covered with screenings as before.

The road is then thrown open to traffic and during the first few weeks may require further screenings to take up any excess of oil. The traffic is of great assistance in forcing the screenings into the oil and compacting and making a homogeneous bituminous carpet on the concrete.

Expansion Joints.

As a rule the so-called expansion joints have been omitted except at the end of the day or half day run of the concrete. As all the concrete bases are intended to be covered with some sort of an asphaltic top, the inevitable lateral cracks, joints or no joints, cause little or no trouble and it is believed that a smoother riding road is secured without the joints.

In cases, in the hot central valleys, there has been some trouble from "buckling" due probably to the absence of elastic joints frequently placed but this is considered a minor trouble.

As the cracks develop they are cleaned out and filled with asphalt.

Sheet Asphalt and Topeka Tops.

The commission has 16.21 miles of state highway in San Mateo County consisting of a broken stone base with a one and one-half inch Topeka mixture top.

In San Mateo, Santa Clara, and Orange counties there are 37.82 miles with concrete bases and either sheet asphalt or Topeka mixture tops.

The broken stone base was an old macadam road of the water-bound variety, worn thin from long use, and so much work had to be done on it and so much new material added it is probable that the road cost nearly, if not quite, as much as if a concrete base had been put in. Good work was secured but it is not expected that further work of the kind will be attempted.

On State Highway Contract No. 1 a sheet asphalt surface 1 inch thick with a paint binder was laid on a cement concrete base 5 inches thick and 24 feet wide for a length of 5.4 miles. This road was completed in 1913 and has remained in excellent condition with small repair costs.

This road takes all the heavy traffic from San Francisco down the Peninsula.

The concrete bases with the one and one-half inch Topeka mixture tops have also been successful and it is probable that much more of this type of work will be done in the future.

Thickness of Concrete Base.

Most of the concrete road bases have been built from four to four and one-half inches in thickness.[a]

It has always been the plan ultimately to cover the concrete with bituminous material but for the two years past little of such surfacing has been done. It was recognized early that the second bond issue would fall far short of completing the roads contemplated and the bituminous top was one item which could be omitted, temporarily at least.

It must be admitted that a concrete base so thin as four inches would not be at all suitable in localities where the frost penetrates deeply into the ground and nowhere in California has concrete been laid under such conditions.

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[a] South of San Francisco on the road to San Jose there are about 23 miles where the concrete base is 5 inches thick.

It must also be admitted that experience has shown that over adobe subgrade it is not wise to lay so thin a base unless it is reinforced with steel. Even with such reinforcement longitudinal cracks develop which widen year by year despite frequent filling with asphalt, and a weakened pavement results. The reinforcement, without the use of more steel than seems justifiable, will not prevent the longitudinal cracks but it appears to hold the concrete together and in some measure to lessen the progressive widening of the cracks. Increasing the thickness of the concrete *per se* does not remedy the longitudinal crack difficulty.

The thin bases have given admirable service and have proved their economy under California conditions of climate and traffic whenever the underlying subgrade has been firm and hard and the concrete has remained in contact with the subgrade.

It is true that in some localities the concrete has broken and disintegrated under the traffic but such cases are so rare as to be almost negligible in considering the whole system.

Sometimes this has been the result, beyond doubt, of a thinner pavement than was specified due to the carelessness of the contractor and not noticed by the inspecting engineer. Sometimes the concrete mixture was defective due to the absence of sufficient cement or to insufficient mixing or to the use of dirty aggregates. These things happen in all construction work but in considering the whole system, such lapses are very exceptional.

In the northern part of the Sacramento Valley a new difficulty presents itself in the rapidly increasing use of the land for rice culture. This sort of farming requires extraordinary quantities of water. The natural drainage channels are blocked by rice checks and the water stands in the borrow pits along the road and the subgrade under the concrete pavement is saturated and remains so for long periods. In places, where the water is drained from the fields, it backs up so as to cover the pavement.

A subgrade so saturated will not sustain the four-inch base with the heavy traffic and the pavement cracks and disintegrates. Plate XXXIV, gives some idea of the water difficulty due to the rice culture.

Recently much trouble has been experienced between Williams, in Colusa County, and Willows, in Glenn County. In November and December of this year the state highway has been damaged seriously by motor trucks hauling rice. The sacked rice, according to a report of the division engineer,

> "* * * is brought from the fields with teams and stacked on the shoulders along the state highway. It is here picked up by 2½ to 5-ton trucks, which never leave the pavement, and are thus enabled to carry excessive loads. In some cases the rice is loaded with a bucket elevator or stacker, which piles the rice high on the rear end, thus concentrating 90 per cent to 95 per cent of the load on the rear wheels.

> All of the trucks carry loads in excess of their rated capacity, and it is probable that in all such cases the loading on the rear wheels per inch of width of tire in contact with the pavement is in excess of the limit of 800 pounds fixed by the Motor Vehicle Act. Where a normal overload only is carried this excess is probably not very great.
>
> In the instance above referred to, the trucks have been overloaded to such an extent that in some cases it is probable that the load was in excess of 1400 pounds per inch in width. * * * Over twenty bad holes were broken through the pavement by the trucks in the short period of three weeks, and the pavement crushed to the point of early failure in a number of other places."

The foregoing is an illustration of perhaps an extreme case of the selfish use of the highway but the overloading of trucks in general throughout the state is an evil which must be reckoned with.

It would be folly to try to discourage the use of trucks and tractors, but they should conform to the legal requirements of the Vehicle Act which are reasonable and were enacted in 1917 at the suggestion of the Motor Truck Dealers' Association.

If such excessive loads are to be permitted the state must spend much money to strengthen the roads, but why should such selfishness be permitted? Why should not the reasonable provisions of the Vehicle Act be enforced?

But regardless of the overladen trucks, it seems apparent that the concrete bases should in all cases have the bituminous tops applied as soon as it may be done.

The original idea of the commission that bare concrete is not a fit material to receive the impact of heavily loaded vehicles still appears to be sound. Even the thin bituminous carpet is of great aid in distributing the impact.

Comparison of Costs of Work Before and During the War.

In order to get an approximation of the advance in cost of the state highway work due to war conditions, a study has been made of the contracts let in the two periods, before and since the beginning of the war. It is fair to assume the period 1912 to 1916, inclusive, to be the prewar period.

To compare costs fairly it is of course necessary to use weighted averages.[a] The inquiry has been limited to the grading and to the concrete paving items of the contracts, these being by far the most important elements of the work and its cost.

The quantities involved are as follows:

	1912-16 (inclusive)	1917-18	Totals
Grading, cubic yards	6,750,000	2,330,000	9,080,000
Concrete, cubic yards	882,300	252,900	1,135,200

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[a] These averages are found by dividing the total costs for each period by the total quantities of the work performed.

The following tables show by years the average price paid for grading and for concrete during the prewar period and during the war.

Average Contract Prices, [4]1914-1916 (inclusive).

Year	Grading[1] (per cu. yd.)	Concrete including all materials (per cu. yd.)	Sand delivered (per ton)	Broken stone and gravel delivered (per ton)	Cement delivered (per bbl.)	Concrete[2] exclusive of materials (per cu. yd.)
1912	$0 39	$5 82	[3]	[3]	$1 61	[3]
1913	46	5 91	$0 56	$0 58	1 65	$2 56
1914	51	6 75	54	85	1 70	3 03
1915	45	6 26	58	76	1 74	2 84
1916	37	6 37	60	76	1 80	2 90
Average[4]	$0 49	$6 35	$0 56	$0 78	$1 70	$2 92

Average Contract Prices, [4]1917 and 1918.

Year	Grading[1] (per cu. yd.)	Concrete including all materials (per cu. yd.)	Sand delivered (per ton)	Broken stone and gravel delivered (per ton)	Cement delivered (per bbl.)	Concrete[2] exclusive of materials (per cu. yd.)
1917	$0 73	[5]$8 03	$0 66	$0 86	$1 80	$4 17
1918	78	[5]10 51	1 05	1 28	2 20	5 53
Average[4]	$0 74	$8 67	$0 76	$0 96	$1 90	$4 51

[1] Includes all classifications.

[2] This is the item upon which the contractors bid in most cases; the state supplies the materials.

[3] In 1912 the contractors in all cases except one furnished the concrete aggregates.

[4] Weighted average.

[5] In 1917 and 1918 the paving concrete was enriched from 1:2½:5 mixture to 1:2:4. In the prices stated this has been allowed for.

From the foregoing tables it is seen that the average cost of the grading has increased from 49 cents per cubic yard to 74 cents, or 51 per cent.

The concrete in place including all materials has increased from $6.35 per cubic yard to $8.67, or 36.5 per cent.

The last column in both tables is perhaps the most interesting. In most instances the commission delivers to the contractor at the freight siding nearest to his work all of the materials needed for the concrete. The contractor hauls these materials to the work and places them. The figures, therefore, reflect directly the increased cost of labor. The average contract price has advanced from $2.92 per cubic yard to $4.51, or 54.5 per cent.

As in most statistics the tables lack one element which can not be well included. It is possible that during the prewar period the lengths of haul from the freight sidings may have been longer or shorter than in the other period. It is not thought, however, that this element would affect the averages to any considerable extent since the quantities involved are so great, and the commission's work is so standardized as to length of section and other features.

The advanced cost in the concrete is in fact somewhat more than the tables indicate since in 1917 and 1918 the commission spent considerable sums in stockpiling cement and aggregates so that the contractors should suffer the minimum of delay due to irregular movements of freight trains. These extra costs are not included in the computations upon which the tables are based.

Effect of War on Organization.

One has but to look at the commission's Roll of Honor to appreciate the effect of the war on the organization.

No record has been kept of the unskilled laborers on the pay rolls who entered the service of the nation. There were doubtless hundreds of them, but in the following table are shown by vocation the numbers of engineers, construction men, and other skilled workers of the several classes who left the commission's employ for army service:

Assistant division engineers	4
Assistant engineer (headquarters)	1
Office engineer	1
Resident engineers	12
Assistant resident engineers	18
Chiefs of survey parties	9
Instrumentmen	29
Rodmen	44
Chainmen	22
Axmen	6
Draftsmen	32
Superintendents	3
Assistant superintendents	2
Foremen	12
Patrolmen	2
Mechanics	2
Truck drivers	8
Clerks and stenographers	8

It has not been easy to keep the work going efficiently and according to the commission's standards with so many new untrained employees as have been taken on to fill the places of those who entered the army.

The re-employment of those who went to war will be greatly welcomed.

Conclusion.

In 1912, at the beginning of its work the commission set up certain standards or principles to be followed in its state highway work. Briefly stated these were:

1. A readjustment of the road locations or rights of way so as to secure proper alignment and to obviate the necessity of traveling around section corners.
2. Rights of way of uniform width, preferably not less than 60 feet.
3. Maximum gradients in the mountainous country of 7 per cent and minimum radii on the center lines of such roads of 50 feet, with all curves opened out as much as possible by flattening slopes and removing brush and such trees as interfere with the view. A clear sight of at least 150 feet should be secured wherever it is practicable.
4. The construction of permanent culverts, gutters and ditches wherever they are needed to prevent water from standing on the roadsides and on grades to

prevent gullying due to the water being carried too far in the gutter and thus accumulating in volume.

5. The construction of bridges of a permanent character, preferably of reinforced concrete, such bridges to be at least 21 feet wide in the clear and so designed that they will carry 16-ton traction engines with a reasonable factor of safety.

6. A minimum width of roadway of 16 feet, which may be traveled safely, such width to apply only to those places in the mountains where there is so much rock as to make a greater width prohibitive on account of its cost. An average width throughout the remainder of the state of 24 feet on embankments, of 21 feet in through cuts, and 22½ feet where the road is part cut and part fill.

7. A crown or cross-camber varying from one inch to the foot where no surfacing is applied to less than three-eighths of an inch where bituminous surfaces are used, in all cases the crown to be the least needed to cause the water to run quickly from the road into the gutters.

8. Such type of surfacing as the needs of the locality require, varying from the graded road to the highest type of asphalt paving and varying in width from 15 feet to 24 feet.

9. The erection of guardrails at dangerous points on grades and on high embankments.

10. The proper trimming of slopes along the roadsides, both old and new, so as to prevent the unsightly gashes now so noticeable along the roads. Also the planting of suitable trees, indigenous to the locality, and properly caring for them.

11. The placing of proper permanent monuments at the time of construction along the roads to mark accurately the limits of the right of way. Also the erection and maintenance of guideboards marked to show places and distances accurately.

Save in two minor particulars these *desiderata* have been accomplished.

As concerns the tree planting in paragraph 10 and the guideboards in paragraph 11, the performance up to date has been somewhat weak. The tree planting, however, is about to be undertaken on a broader basis but the erection of guideboards has been postponed, wisely probably, until the system is more nearly completed, at which time a more comprehensive and scientific road indicating plan can be worked out than is possible now.

As before stated, a fundamental principle of the commission has been to avoid waste in its operation.

The engineering work has been done carefully; the grading, culverts and bridges have been built as if for all time; the pavement base has been adapted to the needs of the times with due allowance for probable enhanced future traffic and so left that it may be widened, thickened or surfaced as the future needs develop.

What these future needs may be it is idle to attempt to forecast.

The thin concrete base has well proved its usefulness and hundreds of miles of smooth roadway have been provided for use during the past seven years and have well served the public, which would not have been available had the commission resorted to heavier, wider, and consequently more costly pavements.

Respectfully,

A. B. Fletcher,
Highway Engineer.

APPENDIX C.

Statement of Condition.

June 30, 1918.

ASSETS.

(Details below.)

First State Highway Fund expenditures	$18,002,129 00
Second State Highway Fund expenditures	4,654,402 43
Motor Vehicle Fund expenditures	2,907,677 78
Special appropriation expenditures	18,717 74
Expenditures, contributions by counties, cities and federal aid	591,339 74
Cash on hand	147,993 03
Total assets	$26,322,259 72

LIABILITIES.

55	Vouchers payable account	$345,312 45
57	First State Highway Fund	17,975,486 43
57A	Second State Highway Fund	4,512,306 66
58	State General Fund	725 40
58A	Donations	532,117 98
60	Unclaimed wages (S. H. F.)	2,167 91
60A	Unclaimed wages (M. V. F.)	460 98
62	Motor Vehicle Fund	2,873,561 47
64	General appropriation, Chapter 704, Acts 1915	7,321 86
65	General appropriation, Chapter 748, Acts 1915	7,986 50
66	Premiums on first state highway bonds	2,129 00
67	Federal aid road account	59,571 76
68	Special appropriation, Chapter 746, Acts 1917	3,111 32
	Total liabilities	$26,322,259 72

Statement of Condition.

June 30, 1918.

ASSETS.

First State Highway Fund Expenditures.

2	Highways in process		$16,308,250 14
5	Sand plants		20,474 64
20	Construction equipment	$18,255 04	
21	Engineering equipment	18,914 43	
22	Furniture and fixtures	17,038 94	
23	Stable equipment	12,477 54	
24	Automobile equipment	40,839 04	
25	Camp equipment	4,744 67	
26	Laboratory equipment	2,847 42	
	Total equipment		115,117 08
35	Store account		$21,174 76
43	Headquarters expense	$272,101 01	
44	Divisions expense	372,381 08	
72	County expense	892,693 29	
	Total expense		1,537,112 38
	Total State Highway Fund (First) expenditures		$18,002,129 00

Second State Highway Fund Expenditures.

2	Highways in process		$3,872,731 78
5	Sand plants		11,937 73
20	Construction equipment	$40,673 90	
21	Engineering equipment	7,687 93	
22	Furniture and fixtures	8,808 26	
23	Stable equipment	4,946 75	
24	Automobile equipment	34,431 86	
25	Camp equipment	3,087 10	
26	Laboratory equipment	1,664 54	
	Total equipment		101,300 34
35	Store account		10,893 47
43	Headquarters expense	$192,162 87	
44	Divisions expense	256,175 94	
72	County expense	209,200 30	
	Total expense		657,539 11
	Total Second State Highway Fund expenditures		$4,654,402 43

Motor Vehicle Fund Expenditures.

3	Highway maintenance		$2,435,927 67
27	Maintenance equipment	$459,988 80	
106	Oiling plants	791 75	
110	Maintenance yards	1,030 36	
120	Construction equipment	257 09	
122	Furniture and fixtures	2 30	
124	Auto equipment	3,746 42	
128	Shop equipment	1,518 16	
	Total equipment		467,334 88
162	Injuries to employees	$57 00	
163	General expense	205 29	
164	Maintenance of plants	331 85	
165	Repairs to motor vehicles	2,752 97	
166	Repairs to other equipment	1,068 12	
	Total expense		4,415 23
	Total Motor Vehicle Fund expenditures		$2,907,677 78

Special Appropriation Expenditures.

301	Expenditures, Chapter 704, Acts 1915—Los Angeles County	$7,321 86
302	Expenditures, Chapter 748, Acts 1915—Ventura County	7,986 50
304	Expenditures, Chapter 746, Acts 1917—Trinity-Humboldt Extension	667 45
305	Expenditures, Chapter 746, Acts 1917—Oxnard-San Juan	417 37
306	Expenditures, Chapter 746, Acts 1917—Jackson's Ranch	603 36
307	Expenditures, Chapter 746, Acts 1917—Carmel-San Simeon Road	324 58
308	Expenditures, Chapter 746, Acts 1917—Carmel-Jolon Road	350 44
309	Expenditures, Chapter 746, Acts 1917—Dumbarton Bridge	986 09
310	Expenditures, Chapter 746, Acts 1917—Santa Maria	60 09
	Total special appropriation expenditures	$18,717 74

Expenditures, Contributions by Counties, Cities and Federal Aid.

401	Humboldt County	$80,992 63
402	Shasta County	64,000 00
403	Siskiyou County	45,345 33
404	Glenn County	8,421 52
405	Contra Costa County	2,200 00
406	Marin County	35,000 00
407	Napa County	65,000 00
408	Sonoma County	75,000 00
409	San Luis Obispo County	5,000 00

Expenditures, Contributions by Counties, Cities and Federal Aid—Continued.

410	Imperial County	31,944 81
411	Calaveras County	20,000 00
412	Mendocino County	20,000 00
413	Colusa County	4,500 00
414	Solano County	5,000 00
415	Mariposa County	2,200 00
416	Santa Barbara County	50,115 75
417	Kern County	5,904 08
418	Niles	2,143 86
419	San Juan Bautista	9,000 00
		$531,767 98
481	Federal aid—San Mateo County	35,327 20
482	Federal aid—Contra Costa County	24,244 56
	Total	$591,339 74

Cash on Hand.

48	Office Fund—Headquarters	$100 00
49A	Office Fund—Divisions	40,500 00
50	National Bank of D. O. Mills & Co.	99,123 58
52	Farmers and Mechanics Savings Bank	4,202 91
53	California National Bank	4,066 54
	Total cash	$147,993 03

EXPENDITURES IN COUNTIES FROM FIRST STATE HIGHWAY FUND.

During the fiscal year July 1, 1917, to June 30, 1918.

County	Division	Total this year	Previous report	Total to date
Alameda	IV	$18,270 90	$434,381 89	$452,652 79
Alpine	III			
Amador	III	13 78	392 71	406 49
Butte	III	10,371 94	296,282 23	306,654 17
Calaveras	III	*16,665 88	22,459 66	5,793 78
Colusa	III	12,179 02	480,949 10	493,128 12
Contra Costa	IV	(a)*13,964 81	265,651 18	251,686 37
Del Norte	I	604 96	10,371 99	10,976 95
El Dorado	III	9,494 97	277,654 76	287,149 73
Fresno	VI	11,289 21	237,110 17	248,399 38
Glenn	III	5,360 04	245,053 25	250,413 29
Humboldt	I	37,104 46	636,116 59	673,221 05
Imperial	VII	15,976 56	388,918 85	404,895 41
Inyo	VI	982 11	20,627 14	21,609 25
Kern	VI	40,114 25	842,530 36	882,644 61
Kings	VI	4,842 65	101,711 73	106,554 38
Lake	I	89	15 15	16 04
Lassen	II	44 89	669 46	714 35
Los Angeles	VII	50,694 81	1,234,067 54	1,284,762 35
Madera	VI	10,020 14	210,456 51	220,476 65
Marin	IV	*25,357 62	261,438 03	236,080 41
Mariposa	VI	6,450 51	183,886 65	190,337 16
Mendocino	I	43,525 34	746,194 07	789,719 41
Merced	VI	15,585 89	327,355 08	342,940 97
Modoc	II	2 06	31 00	33 06
Mono	VI	4,000 56	84,024 63	88,025 19
Monterey	V	32,062 21	586,867 45	618,929 66
Napa	IV	*64,427 66	83,757 75	19,330 09

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*Contributions by county or federal aid received during the year (applying to work done in previous years) amount to more than the expenditures for the year.

(a) Federal aid, $24,244.56.

EXPENDITURES IN COUNTIES FROM FIRST STATE HIGHWAY FUND—Continued.

County	Division	Total this year	Previous report	Total to date
Nevada	III	$272 71	$7,790 75	$8,063 46
Orange	VII	11,868 43	517,039 84	528,908 27
Placer	III	12,314 64	351,779 35	364,093 99
Plumas	III	1 98	56 60	58 58
Riverside	VII	3,647 60	88,794 51	92,442 11
Sacramento	III	3,514 60	100,397 43	103,912 03
San Benito	V	8,120 57	222,716 36	230,836 93
San Bernardino	VII	10,299 58	250,722 17	261,021 75
San Diego	VII	30,317 44	591,870 77	622,188 21
San Francisco	IV	----------	----------	----------
San Joaquin	III	144 68	4,133 40	4,278 08
San Luis Obispo	V	40,873 99	782,697 27	823,571 26
San Mateo	IV	(b)*17,963 35	443,092 24	425,128 89
Santa Barbara	V	46,770 39	792,894 20	839,664 59
Santa Clara	IV	34,107 14	891,915 49	926,022 63
Santa Cruz	IV	8,782 55	206,244 93	215,027 48
Shasta	II	*33,771 09	514,801 31	481,030 22
Sierra	III	600 79	17,162 96	17,763 75
Siskiyou	II	24,286 74	362,186 45	386,473 19
Solano	III	10,852 98	392,142 96	402,995 94
Sonoma	III	*63,531 51	558,379 73	494,848 22
Stanislaus	III	10,327 98	295,028 20	305,356 18
Sutter	III	3,640 02	103,980 66	107,620 68
Tehama	II	18,702 42	278,908 00	297,610 42
Trinity	II	441 73	6,588 23	7,029 96
Tulare	VI	11,150 48	234,195 19	245,345 67
Tuolumne	III	4,389 35	125,386 40	129,775 75
Ventura	VII	23,962 97	583,331 57	607,294 54
Yolo	III	25,777 62	736,357 16	762,134 78
Yuba	III	4,124 72	117,826 61	121,951 33
Totals	--------	$442,604 33	$17,557,395 67	$18,000,000 00
General expense, undistributed (premiums on bonds)	--------	----------	2,129 00	2,129 00
Grand totals	--------	$442,604 33	$17,559,524 67	$18,002,129 00

*Contributions by county or federal aid received during the year (applying to work done in previous years) amount to more than the expenditures for the year.

(b) Federal aid, $35,327.20.

EXPENDITURES IN COUNTIES FROM SECOND STATE HIGHWAY FUND.

During the fiscal year July 1, 1917, to June 30, 1918.

County	Division	Expenditures for year*	County	Division	Expenditures for year*
Alameda	IV	$119,308 15	San Benito	V	4,068 18
Alpine	III	----------	San Bernardino	VII	9,583 30
Amador	III	4,556 05	San Diego	VII	156,859 49
Butte	III	20,595 06	San Francisco	IV	----------
Calaveras	III	41,743 33	San Joaquin	III	7,168 93
Colusa	III	75 26	San Luis Obispo	V	86,128 07
Contra Costa	IV	131,850 10	San Mateo	IV	14,071 58
Del Norte	I	12,909 30	Santa Barbara	V	378,611 87
El Dorado	III	66,224 24	Santa Clara	IV	59,193 54
Fresno	VI	2,988 51	Santa Cruz	IV	4,777 94
Glenn	III	63 66	Shasta	II	300,348 86
Humboldt	I	154,026 91	Sierra	II	33,304 83
Imperial	VII	19,388 69	Siskiyou	II	54,136 10
Inyo	VI	22,232 00	Solano	III	98,490 71
Kern	VI	11,224 75	Sonoma	IV	65,233 05
Kings	VI	488 01	Stanislaus	III	9,723 55
Lake	I	1,783 54	Sutter	III	12 63
Lassen	II	2,702 13	Tehama	II	34,457 72
Los Angeles	VII	482,679 37	Trinity	II	11,954 65
Madera	VI	275 69	Tulare	VI	364,021 44
Marin	IV	116,479 02	Tuolumne	III	2,274 44
Mariposa	VI	149,721 78	Ventura	VII	51,444 09
Mendocino	I	363,105 30	Yolo	III	128,200 06
Merced	VI	7,117 10	Yuba	III	34,869 79
Modoc	II	2,158 55			
Mono	VI	40,771 40	Total	----------	$4,081,932 08
Monterey	V	207,843 08			
Napa	IV	76,338 96	Highways	----------	$3,872,731 78
Nevada	III	89,689 08	Surveys	----------	209,200 30
Orange	VII	4,177 10			
Placer	III	10,306 93			
Plumas	III	2,546 25			
Riverside	VII	3,966 29			
Sacramento	III	3,661 67	Total amount charged to date to counties	----------	$4,081,932 08

*As this fund did not become available until after July 1, 1917, the above figures also represent the total expenditures to June 30, 1918.

APPENDIX D.

LEGAL DEPARTMENT.

By CHARLES C. CARLETON, Attorney.

The California Highway Commission appointed its attorney in November, 1911, who has since devoted his entire time to its right of way, legislative, claim and legal activities.

It became apparent from the beginning of the highway work that a legal adviser directly attached to the commission was a necessity, and accordingly, with the consent of the Governor and the Attorney General of California, the writer, who had had previous experience in similar work, was chosen and has been intimately associated with the growth of the commission from a force of a few employees to an organization with seven divisions throughout the state, and has attended practically every meeting of the commission in the capacity of such legal adviser.

In the first months of the state highway activities in 1911-1912, the legal interpretation of the basic laws under which the commission existed became essential, so that the early work of the legal department was entirely advisory in its nature.

After the engineering organization of the commission was formed in the winter of 1912, preparations were made for actual state highway construction and the acquisition of essential rights of way became imperative.

The attorney made a personal inspection of the road records in the offices of the boards of supervisors and county surveyors of many counties of California, and compiled preliminary right of way reports relative to the title of these counties to the sections of county highway which were proposed to be incorporated in the new state highway system.

In a number of counties these records were, at the time, in a rather chaotic condition so that much time was required in searching the title of the public in existing roads.

The commission, at the outset, recognized the importance of proper highway locations and the acquisition of rights of way of sufficient width to be sightly and to provide adequate space for highway improvement, tree planting and the orderly arrangement of public utilities.

In many localities the existing roads were not suitable either in whole or in part for the new state highways which were to be built according to modern engineering standards, so that hundreds of miles of new right of way have had to be obtained, but the right of way man has always endeavored to keep well in advance of the road builder.

The method of standardization of the state highway rights of way has now been adopted by many counties and the elimination of the old right-angle turns, while provocative of much right of way controversy with owners who have placed unwarranted values on these small corners of their land, has, nevertheless, set an example for safe turns that are now being demanded by the traveling public everywhere.

That there has been a diligent effort to obtain proper title to the state highway locations before the construction crews have commenced operations thereon is evidenced by the fact that in seven years there has not been an injunction or trespass proceeding instituted against the state or the commission.

In 1912 it became apparent that the first bond issue of $18,000,000 was inadequate for the great highway undertaking projected, and the boards of supervisors of the several counties of California were approached and requested to furnish the necessary rights of way and bridges for the state highway system. The boards of supervisors promptly responded to the call for such co-operation, with the result that thereafter the actual personal solicitation for rights of way from the landowners themselves became largely the duty of county agents.

While this aid avoided the necessity of the commission giving to its attorney a staff of state right of way agents, yet the attorney has closely co-operated with the county authorities and has constantly consulted with their district attorneys and county right of way agents in right of way matters, to the end that the necessary rights of way might be obtained in an orderly and legal manner.

The attorney drafted an act (Chapter 256, Statutes 1913) which was passed by the 1913 legislature, permitting counties to acquire rights of way for state highways, to pay a portion of the expense of constructing state highways and bridges within their limits,. and authorizing the state to accept the same.

Under the authority of this act the counties have afforded aid to the state to the extent of hundreds of thousands of dollars, and all condemnation proceedings for the acquisition of state highway rights of way have been handled, with the exception of one suit which was personally conducted and adjusted by the attorney for the commission, directly by district attorneys.

This act provides for a summary condemnation proceeding by the county to acquire a state highway right of way without the necessity of a preliminary petition, view of the premises and award of damages, as in the case of ordinary county roads. Suits thereunder may be instituted directly by the counties upon the receipt of a formal request from the State Department of Engineering.

However, the attorney for the commission has counseled with the district attorneys in most of the cases and furnished advice and forms of pleadings for their guidance.

The suits in eminent domain commenced by the county authorities have, in a majority of cases, been settled out of court, indicating that when recalcitrant landowners fully realize that the demand of the public for the use of their property is determined, they quickly capitulate.

The attorney for the commission has, moreover, in some instances where the county authorities have not reached satisfactory terms with some of the large corporation and individual landowners, personally interviewed them and arranged adjustments.

For two short periods of time a right of way agent has been employed by the commission, directly reporting to the attorney, but with these two exceptions the attorney has handled all the work of the department without further assistance.

During the life of the California Highway Commission there have been three regular sessions of the legislature, viz, 1913, 1915 and 1917.

The early work of the commission was somewhat hampered because of the fact that state highway construction on a large scale had not theretofore been in progress in California and the then existing laws relating to ordinary state building had not been formulated with modern methods of state highway improvement in contemplation.

Accordingly, it became necessary to obtain legislation which would serve to facilitate road construction in the manner intended by the people when in 1910 they approved the "State Highways Act" providing for a bond issue in amount $18,000,000.

The legal department was called upon to draft, or to assist in the drafting, of a number of measures which were deemed to be for the best interests of the new state highway project.

The act hereinbefore mentioned providing the procedure for counties furnishing aid in the matter of rights of way, bridges, fencing, money, labor, materials and other appurtenances toward the state highway enterprise was among the important laws adopted by the legislature of 1913 to promote the state highway work.

The "State Highways Act" prescribed that the state highways, when constructed, should be permanently maintained and controlled by the state of California. But no provision was made therein for funds wherewith to adequately maintain the state highways when completed. The commission, observing that in some states the cost of the maintenance of improved highways was being borne by licenses derived from the registration of motor vehicles, initiated in the legislature of 1913 a bill, in the drafting of which its attorney participated, which legislation was finally adopted in the session of 1913 and which made possible the future maintenance of the state highway system. The attorney for the commission spent considerable time in briefing the laws of the various states in this connection, and before the bill was introduced, rendered opinions to the commission concerning the constitutionality of various features of the proposed motor vehicle legislation, which opinions were subsequently affirmed by the decisions of the Supreme Court of the state of California.

Other legislation for the betterment of the state highway work was passed by the same legislature. Some proposed legislation detrimental to such work was successfully opposed, and the duty was thereafter placed upon the attorney to carefully read all highway bills in that and the succeeding legislatures that might not appear to be for the best interests of the state.

In the 1915 legislature a number of bills were prepared which were considered advantageous to the state highway work; among these were the following:

An act (Chapter 99, Statutes 1915) regulating openings, structures, pipes, trees, etc., on the state highways and the issuance of permits by the State Department of Engineering.

The latter act provides the commission with a procedure whereby it can restrain the indiscriminate tearing up of the state highways or the destruction of trees and regulate the laying or placing of pipes, sewers, railways or other objects, or the cutting, trimming or planting of trees under formal permits issued by it to those regularly seeking the same.

An act (Chapter 399, Statutes 1915) permitting the commission to close state highways in course of construction and providing for a penalty in the case of any person molesting the barriers, signs or lights placed by the commission during state highway maintenance or construction.

An act (Chapter 400, Statutes 1915) providing for the care, management and protection of state highways and penalties for violations of the act, whereby the commission is able to prevent any person draining water from his land onto the state highways, from putting encroachments thereon or from placing any advertising sign on a state highway except under a permit from the commission.

An act (Chapter 549, Statutes 1915) providing that all public contracts shall be accompanied by a bond conditioned to secure the payment of the claims of materialmen, mechanics, laborers or supplymen. Much question had arisen in the courts whether or not the labor and material bond statute, as it theretofore existed, covered provisions, provender, general supplies not actually incorporated in the highway, and team hire, either furnished to a contractor or subcontractor, and the attorney for the commission prepared this act including such items in order to prevent further confusion on these points.

The contract law of the State Department of Engineering was also revised in this session of the legislature in order that the conduct of state highway work on a unit basis might be fully recognized and prescribed, and other amendments were therein made redounding to the welfare of the state highway work.

During the session of the legislature of 1915 it was decided to request the legislature to pass an act (Chapter 404, Statutes 1915) submitting a second state highway bond issue, in amount $15,000,000, to the people for ratification at the general election of 1916. This act was initially drafted by the legal department of the commission, was adopted by the legislature and subsequently approved by the voters of California, being cited as the ''State Highways Act of 1915.''

In the legislative session of 1917 the most important act prepared by the legal department and passed by the legislature was an act (Chapter 537, Statutes 1917) enlarging the powers and duties of the California Highway Commission.

This act placed all the state roads and highways under the active management and supervision of the commission.

It also empowered the commission, at its option and upon the request of the appropriate local authorities, to act in a consulting capacity to county, city, road or boulevard district officials in the matter of local roads and bridges, to prepare plans for same, or to actually receive and expend bond or tax funds raised locally, for highway improvement.

The Vehicle Act of California, as amended in 1917 (Chapter 218, Statutes 1917), also imposed new duties upon the commission.

One of these is to hold hearings to determine whether the licenses of operators or chauffeurs convicted of driving motor vehicles while intoxicated, or convicted for the third time in a calendar year of speeding, shall be revoked or suspended.

The same jurisdiction is given to the commission in cases of reckless drivers or of persons incompetent or unfit to operate motor vehicles because of a mental or physical infirmity or disability.

The proper handling of these cases also adds to the work of the legal department.

At the present time the legal machinery for carrying out the intent of the state highways acts of California and the expenditure of the receipts from the motor vehicle registration is, with the exception of one or two defects which will probably be remedied by the 1919 legislature, in satisfactory operation.

A large volume of claim business has been handled. This has been of two classes—claims directly against the state of California and claims against the contractors engaged in state highway construction. Naturally there arise from construction work of the scope of the state highway activity, claims against the state itself arising both on contract and for alleged injury to persons or property.

There have been over 230 contracts for the building of links in the state highway system. A number of special claims of contractors for damages against the state, arising out of these contracts, have been filed and the merits thereof examined and determined. The attorney has had to appear numerous times in court, before the State Board of Control and the Highway Commission in the contest or hearing of the same.

There has never been a judgment rendered against the state in any action which has been commenced against it by state highway contractors, although some amicable adjustments have been arranged before litigation has been instituted, where the contractors were clearly entitled to legal or equitable relief. The total amount, however, allowed on such claims has been but a small fraction of the original amounts claimed.

Claims for damages to persons and property arising out of the state highway operations have been practically negligible, considering the large mileage of state highways and the extensive construction under way.

Only one action on account of such claims for tort, a personal injury case, has been prosecuted in the courts against the commission, and that has recently been decided by the Appellate Court in favor of the commission and its contractor, who were joined as defendants.

Ordinarily the claimants have accepted the determination of the commission, or the State Board of Control when their claims have been filed with the latter board, after review of their claims.

Labor and material claims against contractors have consumed much time and attention. The funds earned by the contractors are subject to claims for labor and materials under the provisions of section 1184 of the Code of Civil Procedure (Mechanics' Lien Law).

This section provides that a person who has furnished labor or materials or both to a state highway contractor may file a notice with the commission to withhold money due or to become due from the state to the contractor to answer in court to the claimant.

A number of the contractors have had the misfortune to incur a greater or less amount of indebtedness, with the result that the commission has been deluged at times with withhold notices. In some cases amicable adjustments have been arranged by the attorney, but in a large number of cases the commission has been compelled to appear in court and to interplead, offering to pay the moneys impounded by the conflicting claims as the court may finally direct. The attorney has had actions of this description pending in superior courts in as many as a dozen counties of the state at the same time, and the handling of this business has taken as much time of the legal department as any other phase of its work.

For illustration, the attorney has disposed of three interpleader cases in the course of the last few weeks, by reason of which about $35,000, which had been withheld by the commission for many months, was distributed among the creditors.

At times the commission has had in its custody over $100,000 belonging to contractors or their assigns but impounded by withhold notices.

The aim of the commission is to choose responsible contractors, but despite its efforts, financial reverses occur at times, with the result that an avalanche of claims must be handled. On the other hand, a number of contractors who have had no intention of avoiding their just obligations have been greatly handicapped by creditors unnecessarily filing withhold notices and tying up their working capital. It sometimes seems problematical whether state funds should be subjected to this law, with the attendant crippling, in many instances, of public work by reason of the arbitrary and premature filing of stop notices against contractors, particularly after the state requires a bond in half the amount of the contract price to accompany each contract, conditioned to secure the payment of laborers, material- and supply-men.

During his connection with the commission, the attorney has rendered scores of written opinions on all subjects pertinent to the commission's powers, duties and liabilities; has prepared or scrutinized all deeds, contracts, leases, bonds, assignments and other legal instruments passing through the hands of the commission, and has handled in court all litigation in which the commission has become involved without assistance or local counsel except in the hereinbefore mentioned personal injury case, wherein the attorneys for a bonding company, which was obligated to protect the commission, were associated with the commission's attorney in the defense of the case.

No legal fees have ever been paid by the commission to other attorneys, and the expense of the department has been limited to the salary and traveling expenses of its attorney, except in two instances when, for a short period of time, a special right of way agent was temporarily attached to the legal department.

The attorney has appeared before the Railroad Commission on behalf of the California Highway Commission in a large number of matters, for the most part involving the installation of grade crossings or the elimination of grade crossings or the installation of overhead structures or subways.

Since the passage of the Workmen's Compensation, Insurance and Safety Act he has handled all cases of injuries to the employees of the commission, and until the defense of such cases was assumed some months ago for all the state boards by the State Compensation Insurance Fund, appeared in all hearings, in which the California Highway Commission was a defendant, before the Industrial Accident Commission.

Moreover, he has presented a number of applications of the California Highway Commission before the War Department for permits to construct bridges over navigable streams, and, in fact, has appeared for the commission before all boards, federal or state, which involved contests.

There are now pending in the courts a small number of cases in which the commission is interested but the docket book of the legal department now has fewer cases listed than at any time for several years, indicating that most of the cases in which the commission has been involved have been disposed of by final adjudication or compromise.

The cases now pending in the courts at the time of this report are as follows:

People of the State of California vs. *John C. Green* (No. 5002, Superior Court of Marin County). This is a proceeding in eminent domain to acquire a site for the construction of two bridge tenders' houses and for other maintenance purposes at the west approach of the state highway bascule bridge over Petaluma Creek at Green Point, Marin County.

Union Lime Company vs. *Fred Hoffman et al.* (No. B-51692, Superior Court of Los Angeles County). This is an action to have a lien declared upon funds impounded in the hands of the commission on a state highway contract.

Paul D. Buckingham vs. *Commary-Peterson Company et al.* (In the District Court of Appeal, Third Appellate District, transferred from Supreme Court and numbered therein Sac. No. 2675). This is a personal injury action arising out of an accident occurring during the construction of a portion of the state highway in Solano County. (See Vol. 27, California Appellate Decisions, page 844.)

Stirling P. Dobbins, Jr., vs. *Commary-Peterson Company et al.* (No. 5347, Superior Court of Solano County). This is a personal injury case arising out of an accident during the construction of a portion of the state highway in Solano County. Companion case of the foregoing.

E. T. Johnson vs. *State of California* (No. 85780, Superior Court, City and County of San Francisco). This is an action by a state highway contractor against the state of California for damages for alleged breach of a state highway contract in Siskiyou County by the commission.

December, 1918.

APPENDIX E.

GENERAL INSPECTION OF STATE HIGHWAY CONSTRUCTION AND MAINTENANCE.

By LESTER H. GIBSON, Second Assistant Highway Engineer.

The great size of the state of California necessitated the formation of seven divisions, in each of which all construction and maintenance of state highways was under the direction of a Division Engineer who was responsible only to the Highway Engineer.

As the seven division engineers were working somewhat independently of each other, it was determined that there should be an intermediary to assist in creating and maintaining a high standard of construction, in obtaining the proper interpretation of contract specifications, and, in general, in securing uniformity of requirements, methods and results throughout the state.

Accordingly, the position of Second Assistant Highway Engineer was created, and the writer was appointed in that capacity.

The assignment was unique among state highway organizations, and, in order that no conflict in authority or possible personal friction should tend to nullify the position, its scope was more or less limited.

Contract and day labor projects were to be thoroughly inspected, working as independently as possible. No orders were to be given to either engineers or workmen, but the Division Engineer was to be consulted with concerning the conduct of the work, and reports were to be made to the Highway Engineer which would inform him of both satisfactory and faulty features of the job as noted at time of inspection.

The first contract had been awarded in July, 1912, and at the time the duties of the writer were assumed, in May, 1913, a total of thirty-one contracts had been let, several so recently, however, that work on them had not been started. Because these contracts were so widely scattered throughout the state, from Mendocino and Yuba counties on the north to San Diego on the south, the railroads were used to reach the nearest towns to the work, and a livery rig obtained to reach the job. As a rule, the whole contract was traversed on foot. Not less than one day was employed in inspection of each contract, and more time was taken when it seemed desirable to do so.

The visits of the writer were never previously announced, and it was possible to judge of the usual working conditions on the contracts. It has been found that not only contractors, but also state employees, sometimes make special preparations if advised in advance that a formal inspection is about to be made.

Compliance with specifications has been the sought-for goal at all times and such compliance has been considered of as much importance on force account work as on contracts.

As a rule, the writer has spent more time on the inspection of day labor jobs than of contracts, frequently remaining on the work from two or three days to a week, living at the camps and studying the camp management as well as the construction features. On such occasions, the executive ability of the superintendents, including their force in handling men and their intelligence in laying out the work, has been judged. The method of keeping time, the prevailing scale of wages, the handling of accounts, and the system of managing and accounting for the commissary supplies have received due care. Much money can be saved or lost by the manner in which the boarding of the men is handled, and it is believed that much improvement has occurred in this department of the work. Special reports have been made on occasions of such inspections, giving the details of construction progress and the business management as well.

Inspection of work performed by prison labor from San Quentin and Folsom state prisons has always been interesting. The writer has spent considerable time in camps where convicts are employed, and has found that the organization of convict work, as regards both the construction and the camp management, must be considered from an entirely different viewpoint than that used in judging free labor jobs. Convicts have been employed in three different divisions, always on mountain road construction, and it has been found to be of utmost importance that there be uniformity in handling all phases of their employment. In general, the manner of inspection of the convict labor organizations has conformed to that of day labor camps.

Inspection trips were at first made by train, but within a year after assuming my duties many more contracts were let, and the jobs were then so close together other means of transportation became advisable. Since June, 1914, therefore, the writer has had the use of an automobile, proceeding in an encircling movement around the state, always going forward and, therefore, saving time and mileage.

In the past five and one-half years, all of California's main highways and most of the secondary roads have been traveled by the writer many times, and under all conditions created by winter and summer weather. The road conditions have been improving rapidly; the unimproved gaps in the state highway have been and are being graded and paved and no one who travels the highways of California today for the first time can realize the condition of the same roads six years ago. But the public is being educated to good roads faster than they can be built, and the writer has been in a position to note the increase in the demand for them.

A number of improvements in methods of construction and in equipment used have been developed during the construction of California highways, notably in the use of the nail template, which is employed everywhere concrete pavement is being laid. This template has projecting nails on its under side and is dragged along the header boards in front of the mixer. As the subgrade must be sufficiently low so as not to be marked by the nails, the danger of pavement being constructed which is thinner than required by specifications is avoided.

Also in the ponding method of curing concrete, by covering the newly laid pavement with water held in by check dams, a distinct California development.

Also the mechanical tamper, which is run by a gasoline engine and strikes off and tamps the concrete in place was first employed, it is believed, on California state highways, and these machines are now manufactured commercially in California and in Eastern states.

As the construction of highways by the California Highway Commission has proceeded, and the finished roads have reached the stage where maintenance is necessary, the writer has been gradually devoting more and more time to that department of the work. It is believed that at the present date at least half of his time is employed on maintenance. As he travels about the state, reports are made to the Highway Engineer of the condition of every section of state highway, and the Division Engineer is also consulted with on the same matter. Points which receive consideration are the need of maintenance where the necessity is observed, neglect in commencing maintenance at the proper time, the diligence of maintenance employees and their adaptability to the work.

Questions are sometimes raised as to whether the proper methods of maintenance are empolyed and changes are suggested.

In addition to the duties already outlined, the writer has occasionally been handed special assignments. Among them, two might be mentioned:

During the years 1916-1917, a special examination of corrugated iron pipe culverts was made in all parts of the state, their general condition and wearing qualities being carefully determined.

In the summer of 1917, a special inspection trip was made which covered all of the state roads which had been acquired by legislative action and which were being transferred to the care of the California Highway Commission by the State Department of Engineering. All of these roads are located in the mountain districts, most of them being in the Sierra Nevada range, and many of them are in the more inaccessible parts of the state. The physical characteristics of the roads, the grades and drainage features were noted and an examination of all existing culverts and structures was made on each and every road, all information obtained being incorporated in a report to the Highway Engineer.

The writer's work has led to much interchange of ideas among the seven division engineers in the state, and the desire for uniformity of inspection and standardization of working methods, which led to the assignment of the duties of the Second Assistant Highway Engineer, has been largely realized.

November, 1918.

APPENDIX F.

GEOLOGICAL WORK AND MATERIAL TESTS.

By Clarence B. Osborne, Geologist.

The geological work for this commission was started in February, 1912, with a corps of six geologists.

In May, 1912, the Testing Laboratory began the testing of materials. From that date to the present time the work has largely been carried on in the laboratory by Mr. F. T. Maddocks, the Testing Engineer. During the summer months of 1913, 1914 and 1916, the laboratory had one helper in addition to the Testing Engineer. The geological force, after May 15, 1912, was reduced and since that date I have carried out the work of this department throughout the state without other assistance.

The work of the Geological Department has consisted in reconnaissance surveys for materials for highway construction. In the undeveloped sections of California the examination of material consisted in locating suitable deposits of rock, sand and gravel, and estimating the quantities available.

In the more developed sections of the state the reconnaissance survey for proposed highways usually consisted in visiting the different developed producing companies, examining their equipment and available supplies and reporting as to possible output and shipping facilities.

In every examination, the different products have been sampled for complete laboratory tests. Where the products have been uniform, average samples have been tested. If the products were found to be variable, then additional samples were taken so as to give an idea of the extreme limits of the product as well as average results.

The Geological Department has also been called on to make an examination of earthquake faults, landslides and other geological phenomena that was likely to affect proposed highway routes.

Testing Laboratory.

The Testing Laboratory tests all samples of material proposed for use in the highway construction. Results of these tests show if the material meets the specifications of the commission. Where there are several available supplies, the tests determine the relative value of the different supplies.

The Testing Laboratory also has made a series of tests on sections of the finished highway, giving the information as to the strength and wear-resisting qualities actually produced in the field.

A number of special tests have been conducted in the laboratory to determine the effect on the highway construction materials when the highway is to be built in regions presenting unusual chemical, physical or temperature conditions.

The Testing Laboratory has made a large number of tests to determine the suitability of hitherto untried materials that have been suggested or recommended for the use of the commission.

SUMMARY OF REGULAR TESTS MADE IN THE LABORATORY FROM THE BEGINNING OF THE WORK IN 1912 TO OCTOBER, 1918.

2262 samples cement tested for—
- Specific gravity.
- Fineness 100 and 200 mesh.
- Setting time.
- Tensile strength neat.
- Tensile strength Standard sand.
- Constancy of volume in water 28 days.
- Constancy of volume in steam 5 hours.
- Constancy of volume in boiling water 5 hours.

These tests are made according to the methods of the American Society for Testing Materials.

740 sand samples tested for—
- Specific gravity.
- Mineral classification.
- Physical classification.
- Per cent voids loose.
- Per cent voids compacted.
- Granularmetric analysis.
- Tensile strength 1:3 cement mortar at 7 and 28 days.
- Comparison with tensile strength of Standard sand, same cement used.
- Compressive test 1:3 cement mortar at 7 and 28 days.
- Comparison with compressive strength Standard sand mortar.

251 gravel samples tested for—
- Specific gravity.
- Mineral classification.
- Per cent voids loose.
- Per cent voids compacted.
- Weight per cubic foot.
- Granularmetric analysis.
- Compressive strength.

846 compression tests 1:2 1/2:5 concrete tested for—
- Density of concrete.
- Compressive strength at 28 days.

The following is a summary of the concrete tests made during the year 1916. I have not been able to include in this summary all of the tests made down to the present date, but there are found in this summary a fairly wide range of sands from all parts of California, and the results are indicative of the problems and results throughout all of the concrete testing for the past six years.

Summary of Concrete Tests for Year 1916.

I. SANDS.

Tests applied to sands.

The same tests and methods have been applied to all samples of concrete sands received during 1916 as described in previous yearly reports. These tests, tabulated in order of their importance are:

1. Strength tests—1:3 mortars by weight; normal consistency.
2. Grading.
3. Silt and organic matter.
4. Voids—loose and compacted material.
5. Weight per cubic foot—loose and compacted material.
6. Specific gravity.

Summary of results.

For a basis of comparison all sands are divided into four classes as shown in the following tables:

TABLE A. Tests Failing in Both the 100- and 30-mesh Requirements.

Test No.	Per cent passing 100-mesh sieve	Per cent passing 30-mesh sieve	Per cent of strength of standard sand				
			Tension			Compression	
			3-day	7-day	28-day	7-day	28-day
545	6.3	59.5	69.9	84.1	89.4	67.1	81.9
567	12.4	53.4	----------	96.8	99.4	90.9	72.0
581	8.4	78.0	53.9	59.6	74.8	----------	54.3
592	10.3	50.6	97.2	100.6	114.1	99.4	102.7

TABLE B. Tests Failing in the 100-mesh Requirement But Passing the 30-mesh Requirement.

Test No.	Per cent passing 100-mesh sieve	Per cent passing 30-mesh sieve	Per cent of strength of standard sand				
			Tension			Compression	
			3-day	7-day	28-day	7-day	28-day
544	6.5	24.9	82.3	95.5	109.0	94.8	86.5
549	7.2	43.4	98.7	125.2	136.5	91.3	112.8
550	6.2	37.0	104.0	126.3	124.3	104.4	124.9
566	11.2	49.9	88.8	102.8	108.9	95.7	107.5
571	6.1	38.5	111.7	139.9	146.4	141.2	130.3
591	10.3	48.8	54.6	73.8	88.1	71.3	85.6

TABLE C. Tests Passing the 100-mesh Requirement But Failing the 30-mesh Requirement. (More than 50 Per Cent Passing 30.)

Test No.	Per cent passing 100-mesh sieve	Per cent passing 30-mesh sieve	Per cent of strength of standard sand				
			Tension			Compression	
			3-day	7-day	28-day	7-day	28-day
537	3.6	54.3	89.3	97.4	86.6	79.2	87.1
540	5.2	57.0	76.3	91.0	110.2	81.2	109.4
548	1.6	57.4	101.7	110.4	113.2	91.6	105.1
564	1.4	64.1	86.6	95.3	96.5	76.0	91.4
568	3.9	55.8	81.6	103.6	104.3	100.0	92.5
575	0.9	69.0	74.8	83.4	104.0	83.1	89.5
578	2.0	64.9	62.9	86.5	98.4	58.2	81.6
582	5.0	54.8	63.5	75.5	81.6	----------	64.2

TABLE C1. Tests Passing the 100-mesh Requirement But Failing in the 30-mesh Requirement. (Less Than 15 Per Cent Passing the 30.)

Test No.	Per cent passing 100-mesh sieve	Per cent passing 30-mesh sieve	Per cent of strength of standard sand				
			Tension			Compression	
			3-day	7-day	28-day	7-day	28-day
526	0.3	9.3	114.2	----------	106.5	119.7	114.7
555	2.9	11.1	154.1	196.4	174.7	129.7	145.0
590	6.0	14.0	101.6	132.2	167.5	----------	118.3

TABLE D. Tests Passing the 100- and 30-mesh Requirements.

Test No.	Per cent passing 100-mesh sieve	Per cent passing 30-mesh sieve	Per cent of strength of standard sand				
			Tension			Compression	
			3-day	7-day	28-day	7-day	28-day
524	0.3	29.7	117.0	114.0	96.2	93.8	106.4
525	2.9	35.5	156.1	140.5	123.5	178.2	134.6
530	0.6	25.1	82.4	91.0	97.8	75.9	96.7
531	5.0	43.8	160.5	100.1	100.0	71.2	91.9
532	0.9	17.6	106.0	106.1	103.0	141.9	130.0
533	1.1	41.9	74.3	92.9	91.1	82.2	67.5
534	0.5	31.3	80.2	84.2	98.1	88.9	75.4
535	1.8	39.3	90.3	89.2	89.5	84.8	85.5
536	1.5	34.5	86.7	101.1	97.2	----------	----------
538	4.5	44.8	96.2	94.7	93.3	90.6	92.7
539	1.6	48.0	47.0	74.5	85.2	59.5	69.6
541	3.3	23.6	115.1	108.1	109.5	----------	133.1
542	4.6	33.1	84.0	99.0	90.6	85.2	81.7
543	2.5	30.1	75.7	88.4	82.5	87.5	81.3
546	1.1	40.3	79.5	83.4	94.3	73.7	88.9
547	2.1	49.3	82.8	78.5	93.2	70.1	83.5
551	2.3	45.4	107.8	107.1	113.2	----------	90.5
552	1.2	41.0	93.5	116.5	106.8	----------	87.4
553	2.5	49.5	95.6	106.0	105.3	92.1	82.5
554	1.6	37.9	104.5	121.9	114.3	96.3	87.4
559	1.9	47.7	95.5	95.7	117.2	89.5	89.2
560	1.2	32.0	90.6	82.7	96.4	60.2	72.5
561	4.3	47.2	87.2	101.2	101.4	81.4	90.8
562	0.8	33.4	80.5	83.5	92.8	73.0	89.8
563	0.4	20.7	98.7	114.5	130.5	140.1	152.3
565	0.4	39.4	97.5	93.3	109.0	101.6	110.4
569	0.5	31.4	73.9	71.5	92.7	65.8	55.4
570	3.3	33.2	91.5	100.5	118.0	----------	----------
572	1.7	32.7	93.4	93.4	112.1	65.6	76.0
573	4.9	34.9	98.1	104.5	119.8	137.2	113.3
574	5.5	41.7	108.6	133.0	117.0	----------	----------
576	4.1	21.7	136.2	154.7	135.8	137.0	133.9
577	1.1	38.4	89.0	94.5	91.0	121.0	111.7
579	1.7	48.5	97.5	109.1	114.1	90.4	108.0
580	3.3	42.9	78.6	83.3	83.5	----------	70.5

Summary of 28-day Tensile and Compressive Strength Tests.

	Tensile	Compressive
Table A—		
Number of tests	4	4
Per cent of tests higher than 85 per cent of standard sand	75	25
Per cent of tests higher than 100 per cent of standard sand	25	25
Table B—		
Number of tests	6	6
Per cent of tests higher than 85 per cent of standard sand	100	100
Per cent of tests higher than 100 per cent of standard sand	83	67
Table C—		
Number of tests	8	8
Per cent of tests higher than 85 per cent of standard sand	87	75
Per cent of tests higher than 100 per cent of standard sand	50	25
Table C1—		
Number of tests	3	3
Per cent of tests higher than 85 per cent of standard sand	100	100
Per cent of tests higher than 100 per cent of standard sand	100	100
Table D—		
Number of tests	35	32
Per cent of tests higher than 85 per cent of standard sand	94	65
Per cent of tests higher than 100 per cent of standard sand	50	31

Comparison of Tensile and Compressive Tests—28 days.

Tensile ratio	Number of tests	Compressive strength			Number of tests with higher ratio in compressive than tensile
		Number of tests			
		Under 85 per cent	85 per cent to 100 per cent	Over 100 per cent	
Table A—					
Under 85 per cent	1	1	0	0	0
85 per cent to 100 per cent	2	2	0	0	0
Over 100 per cent	1	0	0	1	0
Table B—					
Under 85 per cent	0	0	0	0	0
85 per cent to 100 per cent	1	0	1	0	0
Over 100 per cent	5	0	1	4	1
Table C—					
Under 85 per cent	1	1	0	0	0
85 per cent to 100 per cent	3	1	2	0	1
Over 100 per cent	4	0	1	3	0
Table C1—					
Under 85 per cent	0	0	0	0	0
85 per cent to 100 per cent	0	0	0	0	0
Over 100 per cent	3	0	0	3	1
Table D—					
Under 85 per cent	2	2	0	0	0
85 per cent to 100 per cent	16	8	6	2	3
Over 100 per cent	15	2	5	8	5

II. CONCRETES.

Method of testing.

All concrete test pieces were made and tested in accordance with the methods described in the report of January 1, 1916.

Average breaks	First crack	Total break
Up to 1916—		
High value	2,797	3,600
Low value	721	766
Average value	1,680	1,980
During 1916—		
High value	2,234	2,900
Low value	627	753
Average value	1,727	2,232

Summary of results.

In order to determine the relationship existing between sand tests—especially the strength tests—and their resulting concretes, 1-2½-5 mix, the compressive strength of all concrete cubes made up in the laboratory during 1914, 1915, and 1916, have been tabulated, together with the tensile and compressive ratios of sand mortars, grading of sand, and kind and grading of rock. The sand gradings have been designated by the letters A, B, C, C1, and D to conform to the tables under the heading Sand; and the rock gradings by the figures 1, 2, and 3.

1. Approximating a straight line.
2. Deficient in fines.
3. Excess of fines.

	Range in concrete strength
Tensile Ratio of Sand Mortars.	
Tensile ratio above 100 per cent	628 to 2,500+
90 per cent to 100 per cent	1,022 to 2,600+
80 per cent to 90 per cent	1,635 to 2,500
Below 80 per cent	985 to 1,716
Compressive Ratio of Sand Mortars.	
Compressive ratio above 100 per cent	1,276 to 2,600+
90 per cent to 100 per cent	1,238 to 2,600+
80 per cent to 90 per cent	1,163 to 2,600+
70 per cent to 80 per cent	985 to 2,500+
Below 70 per cent	1,723 to 2,270
Tensile and Compressive Ratios of Sand Mortars.	
Both above 100 per cent	1,339 to 2,500+
Tensile above 100 per cent, compressive 90 per cent to 100 per cent	1,238 to 2,500+
Tensile above 100 per cent, compressive below 80 per cent	1,115 to 2,373
Compressive above 100 per cent, tensile 90 per cent to 100 per cent	1,276 to 2,600+
Compressive above 100 per cent, tensile below 90 per cent	1,635 to 1,838
Both 90 per cent to 100 per cent	1,410 to 2,600+
Both below 90 per cent	985 to 2,500
Compressive Strength of Mortars.	
Compressive strength above 5,000	1,644 to 2,500+
4,000–5,000	1,162 to 2,600+
3,000–4,000	1,182 to 2,500+
2,000–3,000	985 to 2,500
Sand Grading.	
Class A	1,679 to 2,276
Class B	678 to 2,600+
Class C	978 to 2,500+
Class C1	985 to 2,315
Class D	834 to 2,600+
Rock Grading.	
Class 1	671 to 2,600+
Class 2	1,163 to 2,600+
Class 3	753 to 2,600+
Kind of Rock.	
Gravel	678 to 2,600+
Crushed gravel	1,286 to 2,600+
Crushed rock	985 to 2,600+

The engineering societies will, I believe, finally adopt some desirable, allowable strengths that should be expected for the different concrete mixes for the different character of engineering structures in which the concrete is to be used.

In the laboratory, we have, as far as possible, always made up the concrete test pieces in the mix that is to be used in the field, using the same brand of cement as is to be used in the field, and average samples of the coarse and fine aggregate that are proposed for use.

The laboratory strength of concrete as used in our pavements will usually at the end of 28 days exceed 1,700 pounds per square inch in compression, and although this minimum strength has not been specified, the materials that have failed to give such a strength have not been regarded as acceptable.

222 road metal samples tested for—
- Geological classification.
- Weight per cubic foot loose.
- Weight per cubic foot compacted.
- Specific gravity.
- Per cent absorption.
- Abrasion, Deval test.

350 asphaltic cement samples tested for—
- Specific gravity—U. S. Department of Agriculture Bulletin No. 314, page 4.
- Penetration—American Society for Testing Materials.
- Volatilization at 325°—Bulletin No. 314, page 19.
- Residue from 325° test—Bulletin No. 314, page 19.
- Penetration of residue—See penetration above.
- Solubility, carbon bisulphide—Bulletin No. 314, page 25.
- Solubility carbon tetrachloride—Bulletin No. 314, page 27.
- Solubility 86° naphtha—Bulletin No. 314, page 28.
- Per cent mineral matter—Bulletin No. 314, page 25.
- Fixed carbon—Bulletin No. 314, page 30.

780 asphaltic surface samples tested for—
- Density.
- Density after laboratory compression.
- Per cent bitumen.
- Per cent mineral aggregate.
- Granularmetric analysis of mineral aggregate.

By careful selection of materials and by means of frequent daily samples, the asphaltic surfaces laid by the California Highway Commission have been of uniformly high density, as shown by samples taken from the surface of the finished pavements. The average density has been in excess of 2.25 and the minimum in excess of 2.20.

CALYX CORE DRILL.

Within the past few months, it has been possible for the testing laboratory to make tests of samples taken from the finished pavement. This has been done by the use of a Calyx core drilling outfit, which cuts a 4½-inch cylinder. This core is cut out of the pavement by the use of chilled steel shot. The laboratory has not as yet received a sufficient number of these cores to make possible a complete report on this new method of sampling, but the outfit as far as it has been used has given very satisfactory specimens for compression tests.

This core drilling outfit has been mounted on a light motor truck and pictures of this machine are shown on Plates XXXV and XXXVI.

The drilling power is furnished by a 3-horsepower gasoline motor; the steel core cuts by grinding on the steel shot. Where the coarse aggregate of the concrete pavement is extremely hard and tough, the drilling takes from 30 to 40 minutes. The average concrete pavement can be drilled in from six to fifteen minutes.

The drilling of concrete pavement five or six years old made with gravel which consists largely of indurated sandstone required from 6½ to 10 minutes. Samples made of broken rock from a chert quarry were bored in from 10 to 12 minutes. Concrete made from boulders of extremely hard andesite required from 30 to 40 minutes. The actual time required for boring will be somewhat of an indication of the wear resisting qualities of the pavement, although we have not as yet sufficient tests with this machine to demonstrate how valuable the time feature of the test will prove to be.

The test pieces, however, are in splendid condition for compression tests and, as far as this work has been carried, the indications are that our finished pavement made with a 1:2½:5 mix at the end of three or four years has a total compressive strength in excess of 3,000 pounds per square inch.

To date, the laboratory has only tested pavement constructed of three different kinds of aggregate; namely, broken rock, sandstone gravel and volcanic rock gravel, but these test pieces, taken from different parts of the highway along a stretch twenty miles in length, have all shown a total compressive strength in excess of 3,000 pounds per square inch.

The borings taken from the pavement are valuable also in furnishing an exact record of the thickness and, also, in showing how thoroughly the concrete was mixed at the time of laying.

The holes made in the pavement after the removal of the core are about 5½ inches in diameter and are usually repaired with neat cement and broken rock.

When this mix is used, the cement sets up and gains sufficient strength in a few hours to make unnecessary any careful plan of protecting or curing the repaired holes.

ROAD OIL.

The testing laboratory has received and tested from 1912 to the present date approximately 1,000 samples of road oil. Part of these samples have received only the physical tests unless they showed inconsistent or unusual properties. The methods used in testing are as noted below. The Bulletin No. 314, referred to, is published by the Office of Public Roads and Rural Engineering, U. S. Department of Agriculture.

Tested for—

- Per cent of water and sediment, by use of centrifuge with solvents.
- Specific gravity, Bulletin 314, pp. 4–7.
- Solubility carbon bisulphide, Bulletin 314, p. 25.
- Solubility carbon tetrachloride, Bulletin 314, p. 27.
- Flash point, Bulletin 314, p. 17.
- Burning point, Bulletin 314, p. 17.
- Float test, Bulletin 314, p. 9.
- (Engler) viscosity, Bulletin 314, p. 7.
- (Osborne) adhesive, described later.
- Loss at 212°, Bulletin 314, p. 19.
- Loss at 315° for 5 hours, Bulletin 314, p. 19.
- Float test after 315° test, Bulletin 314, p. 9.
- Per cent of asphalt described later.
- Fixed carbon, Bulletin 314, p. 30.

As most of our road oil samples have been tested for use in the thin bituminous wearing surface, I will describe the tests required in our specifications for such oil.

The first Spanish explorers who ventured to the western coast of America wrote of the discovery of strange springs of ''black pitch'' that they found oozing out of crevices in the sandstone hills and forming pools of black sticky liquid in the hollows of the ground.

This ''black pitch'' was the heavy crude asphaltic oil escaping from some of the vast underground stores of oil, the development of which in the past twenty years has made California one of the great producers of petroleum, road oils and asphalts.

The native Indians knew of this ''black pitch'' long before the arrival of the Spaniards. They had used it as a cement on the cord that bound the stone spear or arrow head to the wooden shaft. They also used the pitch to fasten the bottomless basket to the rounded stone when a new stone mortar was to be made.

Many thousands of years before the time of the Indians, the wild animals also discovered these pools of sticky black liquid. Near Los Angeles there are the remains of a very large pool in which powerful animals became entangled much as flies are caught on tanglefoot paper, and this brea bed, known as the ''Death Trap of the Ages,'' has become a mecca for the geologist because of its wonderfully preserved skeletons of animals now extinct. This pool of sticky oil caught and held and still preserves the skeletons of the giant sloth, the saber-toothed tiger, and the great elephant, animals that in a former geologic age roamed over the hills and valleys of western America.

This history should be interesting to the user of asphaltic road oil for two reasons. First: the oil is shown to have been of importance, due to its being decidedly sticky. Second: although there are many chemicals that readily dissolve asphaltic oil, these enemies do not exist naturally and the heavy oil is very stable chemically when exposed to the attacks of weathering. The asphalt found in the ''Death Trap of the

Ages," after exposure to weathering for thousands of years, is not dead, inert material but is still a fairly "live" cementing asphalt that has hardened under thousands of years of exposure to the elements.

The finished road surface will be subjected to the crushing effect under the heavy loads, to the impact of the iron-shod horse, the grind of the steel-rimmed wheel and the pulling-upward suction of the rubber-tired wheel. These make up the physical forces of modern traffic which forever tend to crush, grind, displace and scatter the road surface. There is no material that unaided can long continue to withstand such an attack.

To these destructive agencies of traffic are added: the erosive action of storm waters, the disrupting forces of frost, the theft of material by the sweeping winds, and the melting and drying action of the hot sunshine.

In the preparation of specifications for asphaltic oil for road building the road engineer has three problems presented. First, he must have requirements controlling the purity of the product, *i. e.*, he desires an oil that is free from foreign material and products of decomposition produced during refining. Second, he must control the important features of the chemical composition of the oil. Third, he must control the physical properties of an oil so that it will actually perform its proper function in the road construction.

The first employment of the asphaltic oils of California for road work was in the application of the light crude oils as dust layers on dirt roads and the use of the refined asphalt for sheet asphalt work. The need of a heavy oil for the thin wearing surface on water-bound and other macadam construction caused the oil refineries to produce a road oil carrying about 80 per cent of 80 penetration asphalt. This oil was heavier than the natural crude and yet not so viscous but that it would penetrate between the rocks which make up the macadam.

The asphaltic oil used in the construction of this bituminous wearing coat is known in the California market as 90/80 asphaltic road oil. This means that the oil contains approximately 90 per cent of asphalt of 80 penetration.

The trade classification of a road oil is a very broad one and includes many oils not satisfactory for the bituminous wearing coat. This type of construction requires a sticky oil, namely, one of high cementing value, and it also requires an oil that is not so viscous but that it can readily be applied to the road and also will allow the easy absorption of the rock screenings.

The road oils of California are the by-products of the oil refineries. The crude oil as it comes from the well may contain only a small percentage of asphalt or it may contain as high as 85 per cent of asphalt. The crude oils contain various amounts of the light and heavy fuel oils and lubricants. These are removed by distillation and the asphaltic road oil is the residue after the removal of the lighter oils.

Some crudes carry high percentages of lubricating oils. Other crudes may be a combination of the light fuel oils and the heavy asphaltic base. The road oils containing heavy lubricants when tested will show relatively high viscosity as compared to their sticky or adhesive properties.

The chemical analysis of the oils seems to furnish little information of use to the road builder in the shape of data as to how the oil will behave as a road surfacing. The road oil used by the California Highway Commission is required to pass specified limits for viscosity and for adhesive strength. The results of these tests give the road builder a measurement of the two most important physical properties of the oil.

Specifications for Road Oil.

The following are the specifications of the California Highway Commission for road oil for the bituminous wearing surface:

GENERAL REQUIREMENTS.

The asphaltic oil is stored in a tank or tanks held for the California Highway Commission. A representative of the California Highway Commission takes samples of this oil as the tank is being filled. The tank is sealed and held until the tests are completed.

When the tests show the oil to satisfy the specifications, it is drawn on, subject to the orders of the California Highway Commission.

The oil is kept under seal and this seal broken and oil car loaded under the inspection of a representative of the California Highway Commission.

The asphaltic oil is shipped in tank cars of standard measurement loaded to gallonage capacity. Such cars are properly equipped with light steam coils that do not permit any leakage of water or live steam into the oil.

SPECIFICATIONS.

(*a*) The oil shall be a natural oil with an asphaltic base, treated to remove water or sediment or the residuum of such an oil from which the volatile material has been removed by distillation, and shall be satisfactory to the engineer. It must not have been injured by overheating, and it must not be obtained by adding solid asphalt to lighter oils or distillate.

(*b*) In determining the quantity of oil delivered, the correction for expansion by heat shall be as follows: From the measured volume of oil received at any temperature above sixty (60) degrees Fahrenheit an amount equivalent to four-tenths (0.4) of one (1) per cent for every ten (10) degrees above sixty (60) degrees Fahrenheit shall be subtracted as the correction for expansion by heat. For the purpose of measuring oil, a temperature of sixty (60) degrees Fahrenheit shall be deemed a normal temperature.

(*c*) Deduction will be made for water and sediment in exact proportion to the percentage of water and sediment found therein, and the oil shall not contain over two (2) per cent of such water and sediment.

To determine the sediment in residuums having a gravity more than 16° Beaumé, it is sometimes best to vary the proportions of testing mixture to the residuum. It is preferable to use 25 cubic centimeters of heavy residuum and 75 cubic centimeters of solvent.

(*d*) After being freed from water and sediment, the oil shall contain not less than ninety (90) per cent of asphalt, having at a temperature of seventy-seven (77) degrees Fahrenheit a penetration of eighty (80) degrees District of Columbia standard. The percentage of asphalt shall be determined by heating twenty-five (25) grams of said oil or residuum in an evaporating oven at a temperature of four hundred (400) degrees Fahrenheit until it has reached the proper consistency when the weight of the residuum shall be determined and the per cent calculated.

(*e*) The oil shall show an adhesive strength of not less than three hundred (300) seconds when tested at a temperature of seventy-seven (77) degrees Fahrenheit by the Osborne adhesive test apparatus at the laboratory of the California Highway Commission.

Early in the construction of the thin bituminous wearing surfaces it was known that the physical properties of the asphaltic oil played a most important part in the behavior of the oil in highway use. The sticky or cementing property of the oils and the viscosity property were the two physical features that required careful measuring to determine if the oil should be used or not.

In order to determine directly the stickiness or adhesive property of road oils, and to establish a basis for comparing them, an attempt was made in our laboratory to develop a mechanical device for gaging their adhesive quality. Experiment finally resulted in the apparatus known as the Osborne Adhesive Machine. In principle the device is a journal lubricated with the oil under test and operated by a constant pull of a given weight, causing the outer cylinder to revolve. The time required for three complete revolutions of this cylinder is taken as the measure of the adhesiveness of the oil. A constant given temperature of 77° Fahrenheit is maintained by means of water flowing through the fixed cylinder or axle.

It has been found that oils which require 300 seconds for the adhesive test will bind the bituminous surface tight to the concrete base and cement together the pieces of crushed rock screenings that make up the mineral aggregate of the wearing surface.

Oils that have a specific viscosity of less than 100 (Engler test) are oils that can be applied under pressure as a spray at a temperature of from 250° to 350° Fahrenheit, and such oils when applied are not "hard." They will readily incorporate the covering of stone screenings and build up a wearing surface of the proper thickness.

The oldest concrete highways with thin bituminous wearing surface constructed by the California Highway Commission have been under heavy traffic for over four years. The bituminous surface is dull black in color, and after exposure to weathering and traffic for this length of time the asphaltic binder is found to be "alive" and sticky and the surface readily mends itself if cut in any way.

The bituminous wearing surface on concrete roads as far as observed has rarely rolled or become wavy under traffic as is so often the case of oil-surfaced macadam. It gives good traction to the rubber-tired traffic and cushions the hard concrete for the horses.

The analysis of samples of this wearing surface after a few years of traffic show it to contain about 9–12 per cent asphalt and the mineral aggregate conforms to a stone filled sheet asphalt, *i. e.*, a sheet asphalt containing about 10 to 30 per cent aggregate retained on a 10-mesh sieve and passing a ½-inch sieve.

QUARRY SITES.

As geologist for the commission, I have made reconnaissance surveys for available road building materials along all of the proposed highway routes where there were few or no developed commercial plants.

A quarry site and sand and gravel bed were taken up for the California Highway Commission under the mining law for the work on the Ridge Route on L.A-4-B, C and D. Quarry claims were also taken for the Highway Commission along the route from San Diego to the Imperial Valley and the eastern part of San Diego County, where there were few available supplies of road material.

APPENDIX G.

THE PURCHASING DEPARTMENT.

By R. C. PENTER, Purchasing Agent.

As the mileage of constructed highways has increased, the maintenance department has continuously grown. This, together with the many day labor and convict camps, more than anything else, is responsible for the development and expansion of the purchasing department.

Several years ago, when construction was wholly by contract and maintenance not yet necessary, the number of orders and letters issuing from this department was not more than one-fifth of the present daily output. The records of few departments will show a more diversified range of purchases. Requisitions for office supplies, engineering equipment and supplies, road material, road machinery, maintenance machinery, machine tools, camping outfits and groceries, clothing, boots and shoes, wagons, harness and leather, hay and grain, gasoline, distillate, oils and greases, and explosives are but a few of the many reaching the department daily.

The methods of procedure, upon receipt from the Highway Engineer of requisitions approved by him, vary. With a few exceptions—always whenever advisable—competitive bids are received. This invariably is true except in the case of such commodities as oil, gas and greases, minor office supplies and occasional emergencies, where delay would be more serious than a lack of competition. The cost of competitive bidding is considerable, but the saving therefrom is enormous. That is why, even at the expense of an occasional delay, purchases without competition are kept at an absolute minimum.

It is the aim of the department at all times to keep in close touch with the trade. The result has been most gratifying and has justified the effort. This is proved in our purchases of those commodities whereon there is no competition, and of others where there of necessity can not be any. Records of current prices of such articles obtaining in each locality throughout the state are kept always at hand, and an order can be issued at a moment's notice with the knowledge that such order carries on its face the best price obtainable.

While on the subject of records, it is well to state that our aim has been to keep them at the lowest minimum consistent with efficiency. The system finally evolved is not ideal, but it is as nearly so as is possible without adopting one of those elaborate ones, which would necessitate a considerable and unnecessary increase in the clerical force. Such systems frequently defeat the ends they seek to attain.

Aside from purchasing, the department has two other important duties. All invoices, before going to the accounting department for payment, are first checked and approved as to terms and prices, and all freight bills are carefully scrutinized. For this purpose, a complete file of current tariffs always is at hand. The other duty is traffic, and at least during the past two years of rate increases, car shortages and congestion, it has not been an unimportant one. We must not only buy, but deliver. Always in the West, there is a car shortage sometime during the year. Usually this begins about the middle of the summer and extends through the fall into the early winter. It is at its worst while grapes, grain and fruit are moving, and includes both closed and open cars of certain classes of which we feel the lack principally in the movement of cement, rock, sand and gravel.

Since the entry of the United States into the war with the consequent immense increase of traffic on the railroads, this car shortage has increased immeasurably. It is now at no time wholly absent, and at many times is stringent in the extreme.

Under these conditions, we have had to do the best we could. We have kept in close touch with the railroad companies, and when cars were available, have loaded them promptly, moving them as rapidly as possible, and released them without delay. In the case of rock and sand, we at times have been able to relieve critical situations by taking flat cars and putting sideboards on them ourselves. As result of these efforts and our vigilance, all work under way has proceeded without avoidable delay.

The cost of moving the vast amount of materials on the various projects under way has increased enormously. For several years the commission has enjoyed special rates on virtually all roads in California. Many of them published tariffs extending one-half of class rates on all incidental C.L. and L.C.L. movements, and special commodity rates which were often considerably less than one-half of tariff rates, on such items as cement, rock, sand, gravel, oil and asphaltum.

On June 25 last, a special increase of 25 per cent in all rates went into effect. This increase worked no particular hardship on this commission, for it in no way abolished or affected our special commodity rates, and on such shipments as were made subject to class rates we still paid but half of the new or increased rate.

On August 5, however, all special rates throughout the United States were abolished. We now pay full tariff rates on all shipments. In many cases, notably on rock and sand, there is being assessed five times as much as there was before August 5. The total average increase in rates on all shipments will equal perhaps 250 per cent.

November, 1918.

APPENDIX H.

ACCOUNTING DEPARTMENT.

By H. B. WEAVER, Chief Accountant.

The accounting system of the California Highway Commission was installed by Klink, Bean & Co., Accountants, of San Francisco, and is modeled after systems used by large business concerns. This system with minor changes made necessary by changing conditions, has proven very efficient. It provides well-defined channels through which all transactions pass, with a complete check on such transactions.

The first chief accountant of the commission, under this system, was Frederick H. Cass, of Sacramento, and upon his death in October, 1912, John H. Small, of Acampo, was appointed and served until March 1, 1918.

As the state highway acts of 1909 and 1915 provide that the interest on the state highway bonds shall be paid by the counties (in proportion to the amounts spent in the various counties), all charges that can be, are segregated by counties and the general expense is later distributed in proportion to the amounts so charged. A detail of charges by counties will be found in the "Statement of Condition" as of June 30, 1918, which is included in this report as Appendix "C."

For the First State Highway Fund, the total amount of the expenditures has been segregated by counties: For the Second State Highway Fund, only the direct charges have been thus segregated, the general expense to be distributed when the total amount of the fund has been expended.

The maintenance of the completed highways, which is financed from the Motor Vehicle Fund, becomes of increasing importance as the mileage of the completed highways increases.

The original accounting system did not provide for "maintenance" charges but accounts have been established following the general arrangement of the "construction" accounts. Complete detailed records are kept of all expenditures from the Motor Vehicle Fund and data in regard to such expenditures, segregated by calendar years, is shown in this report under Appendix "J."

Accounts have also been provided for the expenditures from special appropriations, federal aid and contributions by counties and cities, as shown in the Statement of Condition, Appendix "C."

The arrangement of the construction accounts, covering expenditures from the state highway funds, is shown by the chart on page 98.

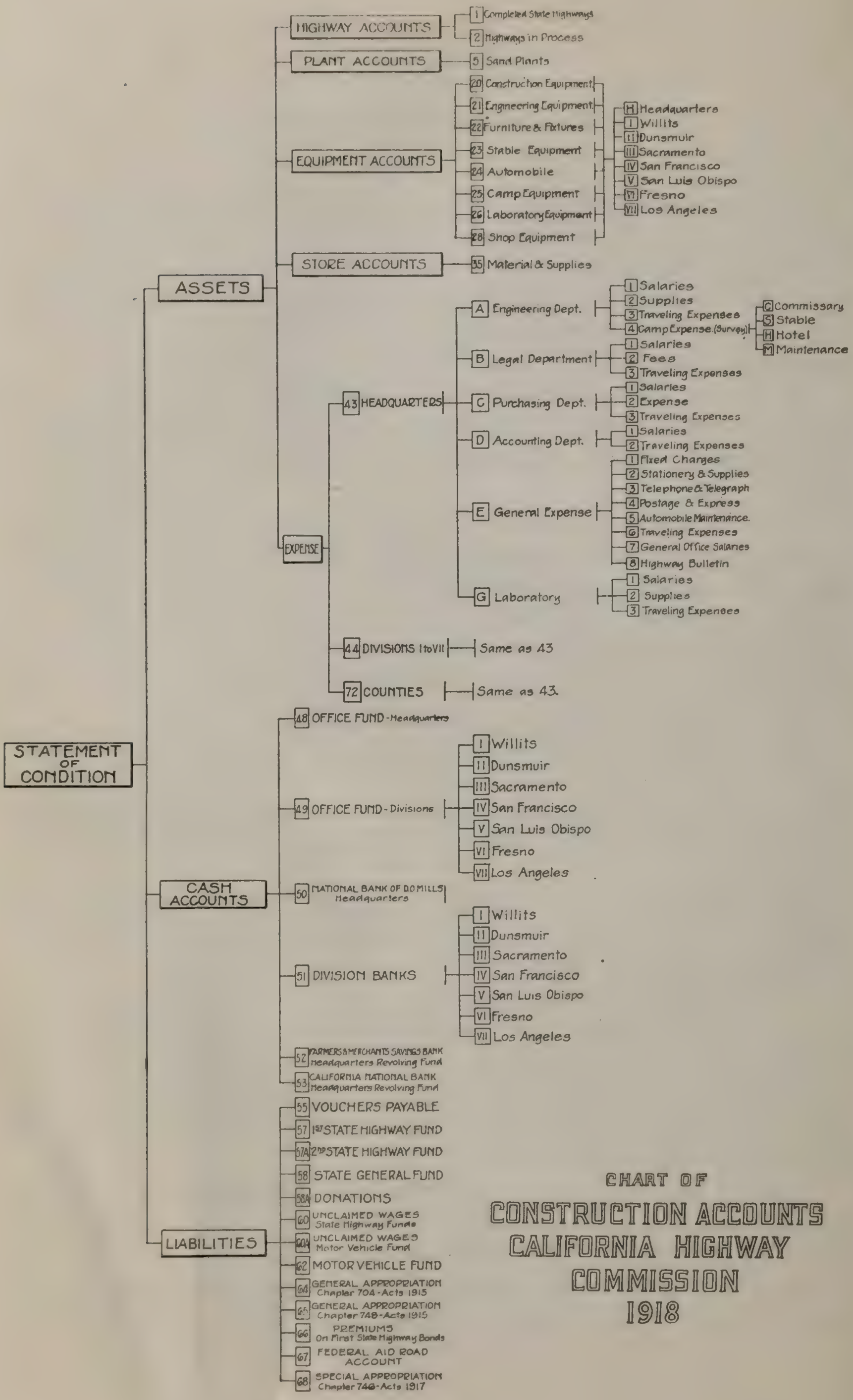

CHART OF
CONSTRUCTION ACCOUNTS
CALIFORNIA HIGHWAY
COMMISSION
1918

The expenditures of the commission come under four main subdivisions, namely, contract payments, salaries and wages, traveling and incidental expenses of employees, and purchases of material, equipment and supplies. While the method of handling these various classes of expenditures necessarily varies in detail, they all follow the same general course through the department and, broadly, the steps taken are as follows:

Contract Payments.

Contract payments are based on estimates, prepared monthly or semi-monthly, by the Division Engineer in whose division the work is located. These estimates are forwarded to headquarters office, checked, and combined in schedules, as described below under "Purchases," and the schedules then follow the same course as schedules covering other expenditures.

Salaries and Wages.

Pay rolls are prepared monthly at headquarters and in each division for staff employees, and weekly in each division for laborers and other employees on day-labor work, and they are likewise combined in schedules at headquarters and passed on for final audit and payment in the regular manner.

In the case of the pay rolls for day-labor employees, it is not feasible to require the employees to await the regular course of payment, and, therefore, division revolving funds have been provided, by means of which these employees are paid weekly. The pay rolls of the several divisions are then forwarded to Sacramento, assembled in schedules, and passed for payment in the regular manner, and when warrants are received from the Controller, the revolving funds are reimbursed.

Traveling Expenses.

Under this head are included traveling expenses of employees, together with small contingent items, the accounts for which are prepared by the employees who incurred the expense, and from time to time these accounts are assembled in schedules and the schedules take the regular course. In some cases, to avoid inconvenience or unnecessary hardship upon the employee, advance payment is made from the revolving fund.

Purchases.

As far as possible, all purchases are made through the headquarters purchasing department, the authority of the division engineers to make purchases being confined to emergency transactions which are necessary to avoid delay to the work, and to services and commodities which necessarily have to be obtained locally. Purchases are made at headquarters upon requisitions from the division or department requiring the goods. It has been the fixed policy of the commission to advance no bills for payment until the goods are received in satisfactory condition, and a regular channel of audit has been established to insure this. Under this policy, after satisfactory quotations have been secured by the purchasing agent, a purchase order is issued to the vendor, setting forth the quantity, description and price of the goods desired, and bearing shipping directions for their delivery. The original of this order is sent to the vendor; two copies are sent to the division office, which, in turn, forwards one copy to the employee in the field, to whom the goods are to be shipped, and the fourth copy is retained at headquarters for the files of the accounting department. Upon the receipt of the goods, they are carefully checked against the purchase order, both for quantity and quality, and a ''receiving record'' showing the receipt and condition of the goods is made up and forwarded to the division office.

The division office makes note of the delivery upon its copy of the purchase order and the receiving record is then forwarded to headquarters.

In the meantime the invoices (in triplicate) for the goods have been forwarded by the vendor to the headquarters office, and, after the prices and freight rates have been checked by the purchasing department, they are passed on to the accounting department. These invoices are then checked against the purchase orders and receiving records, and appropriate accounting references and other data necessary for the proper segregation of the expenditures are attached. The invoices are then grouped by divisions and listed on ''Claim Schedules'' made up in quadruplicate, one copy of which, without copies of the invoices, is retained by the accounting department as a file reference, another copy, with the triplicate copies of the invoices attached, is forwarded to the division office concerned, in order that the division may be in possession of full information regarding all disbursements affecting its work, while the original and duplicate schedules, with the corresponding copies of the invoices attached, are approved by the Highway Engineer and the Auditing Committee of the commission, after which the original is sent to the State Board of Control, the duplicate being retained by the accounting department. Like all other claims against the state, the highway claims go through a final checking and audit by the Board of Control, and with its approval affixed, are advanced to the State Controller, who draws one warrant, in favor of the disbursing officer of the commission, for the total amount of the schedule.

Upon receipt of this warrant the disbursing officer deposits it to the credit of the commission in one of several Sacramento banks and the accounting department then draws checks in favor of the several parties whose claims were listed on the schedule. These checks are signed by the Secretary, as disbursing officer of the commission, and are countersigned by the Highway Engineer, or, in the case of schedules made up in the division offices (as explained below), by a division engineer, after which they are forwarded to the vendors, thus completing the transaction.

Division Purchases.

Transactions covering purchases made by the divisions follow the same general course, except these schedules are made up in the division offices, the triplicate copy being retained by the division and the other three copies being forwarded to headquarters. These schedules then follow the same course as headquarters schedules.

Advance payments from the division revolving funds are sometimes made for truck and team hire, and to a limited extent for other purchases, when the vendors are unable to extend credit. Such items are included in division revolving fund accounts, which are sent to headquarters to be scheduled, the schedules being handled in the same manner as schedules covering the day-labor pay rolls.

The system above described is seemingly overelaborate, but in reality it is simple of administration and no more burdensome than is necessary in the expenditure of public funds. It must be admitted, however, that the paying process is slower because of the various checks and safeguards than would be the case in a private business enterprise. As an offset to the longer time required in which to get his payments, the vendor usually takes into consideration the surety of payment.

Exclusive of pay rolls, the accounting department audits and advances approximately 3,000 claims each month.

The following table shows by months the sums withdrawn from the state treasury, from both the State Highway Fund and the Motor Vehicle Fund, and is given merely to indicate the volume of business handled by the commission:

WITHDRAWALS FROM STATE TREASURY FOR STATE HIGHWAYS.

State Highways Funds (First and Second) and Motor Vehicle Fund.

	1912	1913	1914	1915	1916	1917	1918
January	----------	$111,411	$113,401	$488,442	$589,446	$233,412	$449,440
February	----------	157,346	185,654	718,307	339,727	62,979	361,855
March	$85,606	122,134	151,481	446,515	318,095	142,289	373,462
April	29,041	118,548	126,081	406,148	508,589	137,480	454,986
May	38,922	147,076	299,376	844,382	418,408	190,060	490,084
June	----------	175,178	249,087	504,202	241,773	133,872	735,734
July	71,757	131,159	181,939	821,662	390,192	259,389	----------
August	49,376	170,638	578,125	951,780	281,754	242,742	----------
September	61,558	188,683	604,189	611,228	285,547	298,982	----------
October	65,414	311,433	442,463	790,611	240,725	573,119	----------
November	42,766	208,610	1,001,802	972,219	195,841	384,584	----------
December	111,328	190,463	481,732	759,495	297,618	408,311	----------
Totals	$556,768	$2,032,679	$4,415,923	$8,318,021	$4,107,715	$3,065,219	$2,865,561
Average per month	46,397	169,389	367,993	693,168	342,309	255,435	477,593

APPENDIX J.

Analysis of Maintenance Expenditures.

From January 1, 1914, to December 15, 1914.

	Improvements[1]	Repairs[2]	General maintenance[3]	Totals
Pavement base	$1,015 27	$1,238 74	$774 32	
Pavement surface	11,641 74	5,026 95	2,647 60	
Shoulders	3,732 61	145 50	3,591 56	
Guard rail		28 34	2 50	
Culverts and drains	1,119 66	1,370 89	1,469 96	
Grading	5,307 23			
Roadsides	82 00		252 10	
Trees			4 50	
Totals	$22,898 51	$7,810 42	$8,742 54	$39,451 47
Equipment				43,583 94
Administration and engineering				[4]900 44
Total expenditure				$83,935 85

From December 15, 1914, to December 15, 1915.

	Improvements[1]	Repairs[2]	General maintenance[3]	Totals
Pavement base	$28,523 97	$17,324 10	$3,182 35	
Pavement surface	48,500 33	30,093 83	22,248 37	
Shoulders	67,682 23	1,549 31	10,225 06	
Guard rail	891 71	17 60	465 68	
Bridges and trestles	14,086 62	185 45	38 25	
Culverts and drains	10,183 64	1,854 36	5,099 10	
Grading	2,631 45		198 50	
Roadsides	26,163 43	1,863 21	11,697 51	
Patrolling		371 33	3,271 75	
Trees	597 74		329 46	
Totals	$199,291 15	$53,259 22	$56,756 03	$309,306 40
Equipment				140,211 35
Administration and engineering				[4]5,376 65
Total expenditure				$454,894 40

[1] Improvements: New or additional construction or betterment.

[2] Repairs: Work incident to rebuilding and restoring to original condition.

[3] General maintenance: Work incident to preserving the road. Includes minor repairs.

[4] Administration and engineering: These charges are paid in the first instance from the State Highway Fund and that fund is later reimbursed from the Motor Vehicle Fund. Delays in making such transfers explain the apparent inconsistency in the amounts for the several periods. The total charges for administration and engineering for the four years are $223,291.88, which is 8.9 per cent of the total expenditure from the Motor Vehicle Fund for the same period.

From December 15, 1915, to December 31, 1916.

	Improvements[1]	Repairs[2]	General maintenance[3]	Totals
Pavement base	$181,205 82	$21,482 27	$17,824 00	
Pavement surface	120,165 57	25,237 74	68,014 84	
Shoulders	82,965 78	617 52	29,144 08	
Guard rail	11,361 94	205 52	2,690 79	
Bridges and trestles	13,191 64	3,127 03	2,666 83	
Culverts and drains	28,066 36	14,785 18	28,722 93	
Grading	136,805 79	21,455 82	48,910 26	
Roadsides	50,658 42	1,779 91	26,254 24	
Patrolling			22,589 58	
Trees	4,525 84		669 72	
Totals	$628,947 16	$88,690 99	$247,487 27	$965,125 42
Equipment				159,588 63
Administration and engineering				[4]65,098 05
Total expenditure				$1,189,812 10

From December 31, 1916, to December 31, 1917.

	Improvements[1]	Repairs[2]	General maintenance[3]	Totals
Pavement base	$13,271 65	$4,678 07	$47,174 29	
Pavement surface	66,662 97	13,177 61	102,995 02	
Shoulders	16,861 30	4,587 47	46,291 77	
Guard rail	1,109 40	85 00	5,980 75	
Bridges and trestles	15 65	9,243 25	6,720 34	
Culverts and drains	8,819 51	1,502 49	24,125 94	
Grading	25,281 35	1,003 54	88,868 63	
Roadsides	2,439 63	7,001 62	24,930 73	
Patrolling			7,795 82	
Bridge operation			1,800 00	
Trees			6,525 62	
Totals	$134,461 46	$41,279 05	$363,208 91	$538,949 42
Equipment				81,616 99
Administration and engineering				[4]151,916 74
Total expenditures				$772,483 15

[1] Improvements: New or additional construction or betterment.

[2] Repairs: Work incident to rebuilding and restoring to original condition.

[3] General maintenance: Work incident to preserving the road. Including minor repairs.

[4] Administration and engineering: These charges are paid in the first instance from the State Highway Fund and that fund is later reimbursed from the Motor Vehicle Fund. Delays in making such transfers explain the apparent inconsistency in the amounts for the several periods. The total charges for administration and engineering for the four years are $223,291.88, which is 8.9 per cent of the total expenditure from the Motor Vehicle Fund for the same period.

APPENDIX K.

CONVICT LABOR—CONVICT ROAD WORK IN DIVISION I.

By Francis G. Somner, Division Engineer.

The "Convict Labor Law" of California, enacted by the legislature in 1915, provides that convicts may be employed on the construction and maintenance of the state highway system. It is provided that the Department of Engineering shall supervise the road work and provide the necessary camps and commissariat; also that the Prison Directors shall have control over the discipline and conduct of the men. Convicts so employed shall be granted additional good time allowance, not to exceed one day for each two calendar days they are away from the prison.

The first step in the experiment of working prison labor on state roads was taken when on September 20, 1915, a camp of 47 convicts from San Quentin was established by the Highway Commission in northern Mendocino County. This camp was shortly afterwards increased to 60 men and followed by the installation of another camp of 60 men. From time to time the capacity of the camps was extended, reaching the maximum in July, 1917, of 225 men.

Descriptive.

The first section of road selected by the Highway Commission to be constructed by convict labor embraces a portion of the coast trunk line, extending from San Francisco to the city of Eureka, in Humboldt County, distant 297 miles. The section under discussion is 33.10 miles in length, extending from what is known as Rattlesnake Summit, a point on the old overland road to Eureka, to the Mendocino-Humboldt county line. This stretch may be considered as being the most important link on the coast route in northern California, inasmuch as it eliminates the Bell Springs grade, which, attaining an altitude of 4,100 feet above sea level datum, has always been a formidable barrier to tourist travel at all seasons of the year.

The route lies along the east bank of the South Eel River, traversing a country as rugged and picturesque in character and as remote from civilization as any portion of California; in a virgin state, sparsely settled by homesteaders and accessible by trails only, built by engineers during the survey of the proposed road.

The camps were first located centrally, being situated 23 miles from the nearest coast port, Union Landing, the base of supplies during the major part of the construction of the road. The men were shipped from the prison to Fort Bragg, the nearest railroad station, 45 miles distant, and transported by motor trucks to the camps.

The construction progressed in either direction, until in the course of time the camps became separate units, and as the work progressed to the north and to the south, more accessible bases of supplies were reached and the transportation problem became easier.

Upon the completion of the work described in the foregoing, the convict labor work was extended from Rattlesnake Summit to Arnold, a station on the Northwestern Pacific Railroad, distant 24.53 miles. Three miles of the new work has been completed, and although the new stretch involves some heavy mountain construction, the work is very much facilitated by the existing old roads and the fact that the camps in their new winter quarters will be of easy access from the base of supplies. It is anticipated that the construction as planned will occupy the season of 1919, when 57.53 miles will have been constructed by convict labor.

Construction.

A vast amount of preliminary work was necessary before the actual construction of the road could be prosecuted, including the reconstruction of an abandoned road from the coast to the camp sites, distant 15 miles; the erection of footbridges (wire suspension) and temporary wagon bridges at several crossings of the South Fork of the Eel River; the installation of 45 miles of telephone line, together with the construction of pack trails for the transportation of supplies and the moving of camps in advance of the construction of the road. Inasmuch as the camps were inaccessible during the winter months owing to the impassable condition of the roads and the entire absence of bridges on the Eel River, the transportation of supplies for the year had to be accomplished during the summer season, thus requiring motor truck service and, therefore, side roads of substantial construction. The transportation difficulties encountered and the inaccessibility of the country may be better judged when it is explained that the crossings of the canyons involved the erection of nine bridges of from 130 feet to 300 feet in length, some of them being from 130 feet to 150 feet in height, and the grading of the road was accomplished in advance of the construction of the bridges. Naturally such obstacles created the necessity of transportation of construction supplies and equipment and food supplies by roundabout detours. The transportation difficulties were further aggravated by the frequent suspension of steamboat transportation to the bases of supplies on the coast for long periods, thus necessitating almost prohibitive hauls from distant points. It is needless to say that such conditions were not only trials at times to the conduct of the camps, but the source of much added expense to the cost of the work, and consequently a severe test of the first experiment with convict labor in California.

The permanent work accomplished to date consists of the clearing, grubbing and grading of 36½ miles of road, together with the installation of pipe and concrete culverts and retaining walls. Twenty-seven miles of road are from sixteen to eighteen feet in width and nine miles from twelve to fourteen feet. The work also involved the maintenance of the road during its construction, which extended over a period of three years and included the removal of thousands of yards of slides; also the maintenance of the side roads used for the transportation of supplies and men; all of which is included in the analysis of the cost of the construction of the road.

On August 15, 1917, the road was completed to a width of twelve feet, thus affording a connection with the state highway at the Mendocino-Humboldt county line, and on this date Governor Stephens and party, including the Highway Commission, made an official inspection of the road, camping overnight in the redwoods near Bridges Creek. On July 1, 1918, the road was completed to a proper width and opened for travel.

Organization.

The Highway Commission is represented at each camp by a superintendent, who has full charge of the work, assisted by two or more foremen. A resident engineer is engaged to lay out the work and, with the assistance of a commissary clerk, orders and disburses the supplies to the cookhouse and to the men.

The prison authorities are represented by a head guard, who, with two or more subguards, controls the discipline and conduct of the men.

The men are not guarded and the guards are not armed, there being no firearms in evidence either in the camps or on the work.

A camp physician is constantly in attendance at the camps and a dentist is engaged as the occasions demand.

The day's work consists of eight hours on the grade, Sundays and holidays excepted.

The men are housed in tents and frame buildings. The camps are well lighted and heated. The sanitation conforms to the regulations of the Commission of Immigration and Housing, which covers everything conducive to cleanliness, health and comfort, including bathing facilities.

The food is wholesome and plentiful, the "convict ration" not being at all in evidence. The cooks are selected from the convict labor and the services satisfactory.

Method of Construction.

The work is being accomplished by means of pick and shovel and station cars, wheelbarrows, steam shovel, teams and scrapers and road graders operated by tractors, convict labor being employed in all methods with the exception of the operating crew on the steam shovel. The drilling is accomplished by both hand labor and machine drills. Throughout the entire construction more or less rock has been encountered and drill and powder have been an important factor in the prosecution of the work. The blasting operations have been extremely hazardous, involving the use of 250 tons of powder, and the men have displayed a remarkable aptitude for this class of work, both in caution and efficiency. Only one accident has occurred, for which no one was to blame; unfortunately, this accident proved fatal.

Conduct of the Camps.

The honor system is employed, the men being unguarded at all times, and it may be said the men have as a rule readily responded to the honor system; this, in the face of the diversified personnel of the camp, which comprises men serving sentences from a few months to life, and for crimes ranging from petty larceny to murder, men of all nationalities, from all grades of society and of all trades and professions.

The behavior of the men, both on the work and in camps, and their efficiency on the work, compares favorably with free labor camps, and the exceptions are as few. As a rule a spirit of cheerfulness and contentment prevails; however, occasionally the sense of freedom is irresistible, although the percentage of escapes is small. Undesirable characters, such as malcontents, shirkers, etc., are promptly returned to the prison.

Analysis of Costs.

Cost Per Man Day.

Guards		$0.120
Transportation		.191
Clothing		.267
Subsistence		.930
Housing		.130
Escapes		.031
Medical		.053
Tobacco		.048
		$1.870
Cost per effective man day		2.530
Total number of man days	162,458	
Total number of men shipped to camps	770	
Number of escapes (27 captured)	38	

The cost per effective man day is arrived at by the application of the cost per man day of the percentage of time not employed on the actual construction, which includes time for men employed about camp, lost time on Sundays, holidays and on account of sickness.

QUANTITIES OF WORK DONE.

Excavation—Solid and loose rock	411,125 cubic yards
Earth and clay	336,375 cubic yards
Total	747,500 cubic yards
Excavation per man day	4 cubic yards

Average cost per cubic yard, $0.669.

EXPENDITURES.

Excavation, including clearing and grubbing	$500,077 10
Culverts, retaining walls, etc.	50,150 00
Total expenditure by convict labor	$550,227 10
Total miles of road construction	36.5
Cost per mile	$15,074 70

The expenditures for excavation, culverts, retaining walls, etc., include overhead and engineering, preliminary work and all else incidental to the construction of the road. The bridges were constructed by free labor and their cost is not included in the foregoing statement of costs.

Conclusions.

The theory of convict labor is based on the assumption that a certain percentage of prisoners will make good if given the opportunity. The spirit, muscle and brains are there, but the success or failure depends entirely upon the plan of organization and its management. The proper application of reward for good conduct and diligence and of punishment for misbehavior and indolence bears an important relation to the successful administration of the organization.

The efficiency of the system of dual authority as prescribed by the convict labor law is problematical, the serving of two masters successfully being one of the unsolved problems in all walks of life, and this phase of the organization is one that merits serious consideration in the future enactment of laws relating to convict labor.

The analysis of costs shows an effective cost per man day nearly equal to the laborer's wage during normal times; a logical mathematical conclusion for the reason that ordinarily the free laborer simply ekes a livelihood from the going wages in normal times and the convict laborer is given even a greater share of the necessities of life. However, in all labor camps there is a certain percentage of skilled labor commanding a higher wage, thus affording a margin offsetting in a more or less degree the difference of efficiency, if any, as compared with free labor. The comparison in efficiency is affected by the times and the labor market, and the writer does not feel qualified to establish a definite coefficient.

The prison labor has during the "work or fight" period constructed an important link of the California state highway through an exceptionally rugged and remote country and under severe climatic conditions, as the work was continuous through three winter seasons of heavy rainfall. The results from both humanitarian and economic standpoints may be considered as being satisfactory, and it can be said that the men from the California State Prison at San Quentin have "done their bit toward winning the war."

November, 1918.

CONVICT ROAD WORK IN DIVISION II.

By Thomas A. Bedford, Division Engineer.

Preparing a satisfactory article on convict labor is about as difficult as successfully handling the psychological enigma himself.

Almost every convict who has been in confinement for any length of time has justified himself in his own mind and condemned society for punishing him while the big thieves and wholesale murderers go scot free. He soon becomes extremely sensitive and temperamental and must be handled like a child, but, when carefully handled and properly treated, he becomes an efficient laborer in a road camp. If there is a spark of manhood left in him, it comes to the surface and he is prepared, as well as may be, to re-enter society.

In July, 1916, a convict labor road camp was established in Yuba River Canyon, Sierra County, California.

The work was heavy, running 8,500 cubic yards per mile, mostly solid rock. Food and accommodations were excellent and conditions in general ideal, but results were very unsatisfactory at first.

The first nine months were spent in trying to work under a law which gave the prison authorities and the Highway Commission equal authority in the supervision of the convicts and their work.

"No man can serve two masters," much less a convict and the project was a failure until March, 1917, when the prison authorities gave to the Highway Commission full control. Since that time the organization has been so perfected and the interest of the convict in the work so improved that we are doing the work now for one-half of what we would pay a contractor, or about thirty-five cents per cubic yard for earth excavation and fifty to sixty cents for rock excavation.

There are very few skilled laborers among the convicts on whom much dependence can be placed. It is, therefore, a problem of getting the most out of a lot of simple-minded laborers, the personnel of which changes rapidly. Machinery and other refinements must be introduced very slowly and to a limited extent only. We, therefore, use only simple methods and equipment such as powder, pick and shovel, the wheelbarrow, and cars with track, and the plow and scraper to a limited extent.

The things most essential are complete control of the forces, full co-operation on the part of the prison authorities and a competent superintendent. There are very few men capable of handling convicts who are willing to take a position as superintendent and live with them. The position requires a young, big-hearted chap, full of energy, who can use tact and firmness and still be pleasant and respectful.

Another matter of great importance is the selection of convicts. There should be no short-termers, that is, those with not less than six months to serve, and they should, of course, all be healthy, able-bodied men. Some of our best men are life-termers and some good men are third and fourth termers, though they are long-termers. The short-term ''repeater'' is a weak, dissolute character, who is physically and mentally unfit for work.

At present (November, 1918) the camp contains about one hundred convicts, four guards, four foremen, one superintendent, one timekeeper, one engineering inspector, who is really a foreman on reinforced concrete work, two truck drivers and a head cook.

Guards are not used as foremen but for police duty only, except that when it is necessary to scatter the men to such an extent that four foremen can not see them all, the guards are depended on to see that the men keep working.

Guards seldom make good foremen. They do not understand road work. It is out of their line of business. Furthermore, the placing of the guards in authority who are appointed by the prison authorities is recognizing the dual authority which will soon destroy the organization and cause all kinds of trouble in camp.

The most economical and satisfactory housing is well-built shacks constructed of lumber and tar paper. Tents are expensive and unsatisfactory.

The bunk houses are twenty-five to thirty feet wide by fifty to sixty feet long and are heated by two large wood stoves in winter and ventilated by large screened windows, covered by shutters hinged on the upper edge.

Each man is provided with a steel spring cot, a cotton mattress and plenty of blankets and warm clothing, and he is required to keep himself and his clothing clean.

Shower baths are provided with plenty of hot water, and the convict is given all the good wholesome food he can eat and plenty of tobacco. He is better cared for than he would be in any free labor camp. Criticism has been made that we treated them too well but we know, by experience, that it pays to treat them well.

Between July, 1916, and December, 1917, we built 7.6 miles of road in the Yuba River Canyon at a cost of $11,340.00 per mile, or about $1.30 per cubic yard. This work was mostly rock.

Between December 1, 1917, and the present, another section of thirteen miles has been built at a cost of about $5,500.00 per mile, or about 40 cents per cubic yard. This work was mostly earth.

We are building a road twelve feet wide in excavation and fourteen feet wide in embankment and all in a rough, rugged, mountainous country, where transportation of men and supplies is expensive in summer and almost out of the question in winter. Enough supplies must be stored in camp by the middle of November to last until the middle of April.

Just now the convict camp is a very efficient and money-saving institution. Comparing it with free labor, the convict work day costs about $1.50, while free labor costs $4.00 per day and the convict will do more work than the average free laborer available at the present time.

The cost of convict work day for the period of five weeks, ending September 7, 1918, was as follows:

Cost of Convict Workday.	
Food	.632
Hauling	.049
Transportation	.056
Guarding	.127
Guard maintenance	.023
Clothing Tobacco Medical Escapes	.126
Depreciation of camp equipment	.030
Hauling of camp equipment	---
Miscellaneous	.010
Camp maintenance	.009
Preparing and issuing food	.051
Total	$1.113

Distribution Convict Time.	
Total convict workdays	2444
Sundays and holidays	352
Sick days	126
Bad weather	---
Cook house days	224
Camp maintenance	58
General	11
Total convict days	3215

$$\frac{1.113 \times 3215}{2444} = \$1.46$$

Cost of convict workday.

November, 1918.

CONVICT ROAD WORK IN DIVISION III.

By W. S. CARUTHERS, Division Engineer.

Two sections of state highway in Division III have been worked by convict labor during the years 1916, 1917 and 1918. The work on both sections has been under conditions not entirely suited to the use of convict labor, though such lack of success as there may have been is partly due to the restrictions and regulations under which such work has to be carried on under the California Convict Labor Law.

The cost per convict working day has averaged approximately $1.50 for an aggregate of 44,000 days. In the more remote camps of other divisions I understand that the cost per convict day has been somewhat higher.

The first camp (an honor camp) was established in Calaveras County between Valley Springs and San Andreas, one hundred miles from the prison at Folsom.

The work consisted of grading, graveling, concrete and corrugated pipe culverts and wooden guardrail. The section is 10 miles in length and was what might be called a light grading job as far as yardage is concerned. For a mile or more on each side of the Calaveras River some fairly heavy grading was encountered, the greater percentage being in rock.

Throughout the balance of the section though the grading was light, a great deal of it was in rock where it was necessary to shoot and handle several times the amount of material shown by the cross-sections.

In 75 per cent solid rock the grading cost was	$0.584 per cubic yard
In 50 per cent earth, 50 per cent shale and solid rock cost was	0.384 per cubic yard

The total expenditures on the section were $68,195.65. Of this amount $13,500 was spent in the construction of five concrete bridges for Calaveras County and $18,000 to $20,000 in graveling, dragging and maintaining. The grading, culverts and guardrail cost $35,000, or $3,500 per mile.

The adjoining section on the west, Cal-24-A, is now being graded by contract at a total cost of $53,853, or $5,574.90 per mile. The grading on this section is lighter and of easier construction than the section built by convict labor. While the condition of relatively light grading made it difficult for us to work convict labor to advantage, nevertheless the results secured were by no means unsatisfactory as compared with the probable cost had we used free labor throughout.

In El Dorado County, however, our experience has been different.

The Calaveras camp was an honor camp while the El Dorado camp, on the other hand, is an armed camp. The men are brought out each morning from the prison by trucks and taken back at night. The long distance traveled each way leaves an unsatisfactory number of hours on the work. The men are of an inferior grade and the use of convict labor in El Dorado County has been very unsatisfactory and extremely expensive, and its continuance was justified only on account of the shortage of free labor due to war conditions and also the fact that such free labor as has been available has been inefficient and high priced.

In order to work this kind of labor satisfactorily the camp should be an honor camp and there should be sufficient pick and shovel work to keep a large gang constantly busy, as this class of labor can certainly be worked to the best advantage when up against a bank.

The conditions under which convict labor has been employed in Division III have not been ideal for this class of labor and there has been no real opportunity to determine the efficiency of this class of labor.

November, 1918.

APPENDIX L.

BRIDGE WORK ON STATE HIGHWAYS.

By R. E. Dodge, Office Engineer.

Shortly after the beginning of active work on the state highways in 1912, the California Highway Commission requested the several counties to assist in the work by providing rights of way and bridges. This request met with a gratifying response, and, as a result, the greater part of the new bridges on the state highways have been built by the counties or their cost has been paid wholly or in part by the counties. The bridges built by the counties represent a very material contribution toward the financing of the state highways, roughly estimated to be at least $3,000,000. The exact figures are not available as the counties have not reported the cost of bridges built by them.

The California Highway Commission set forth its general policy in respect to bridges in a vote adopted in September, 1912, as follows:

> "(*a*) All such structures are to be designed by competent engineers and the plans, specifications and workmanship be subject to the inspection and approval of the Highway Engineer of the Department of Engineering.
>
> "(*b*) The width of such structures, exclusive of sidewalks, if any, shall not be less than 21 feet in the clear.
>
> "(*c*) Concrete bridges shall be designed to sustain, in addition to the dead load, a uniform live load of 150 pounds per square foot of roadway, and the floor system to carry a 20-ton traction engine.
>
> "(*d*) Steel bridges of spans less than 150 feet shall be designed to sustain, in addition to the dead load, a uniform live load of 100 pounds per square foot of roadway, and the floor system to carry a 15-ton road roller; for spans in excess of 150 feet, a uniform live load of 85 pounds per square foot of roadway, the floor system to carry a 15-ton road roller as in the case of spans of less than 150 feet.
>
> "(*e*) Trestles shall be designed to sustain, in addition to the dead load, a uniform live load of 150 pounds per square foot of roadway, and the floor system to carry a 15-ton road roller.
>
> "Further, that the commission hereby declares itself in favor of concrete structures whenever such structures are consistently possible because of their substantial permanency."

In the practical interpretation of these general requirements, certain difficulties and inconsistencies have appeared. It became evident that to design long span concrete bridges for a live load of 150 pounds per square foot required unnecessarily expensive structures. Owing to the rapid increase in the weights of motor vehicles, it appeared that a 20-ton tractor was none too heavy a load for the floor systems of steel bridges as well as concrete bridges. Also, the abrupt jump in loading from 100 pounds per square foot to 85 pounds per square foot at a span length of 150 feet led to inconsistencies in the strength required in bridges of only slightly differing lengths. The consensus of opinion among prominent writers on the design of highway bridges favors a live load requirement which gradually decreases as the length of the span increases. As a result of these considerations, it has become the practice to design both steel and concrete bridges of spans less than 50 feet and the floor systems of all bridges for the 20-ton tractor or 150 pounds per square foot, and long span bridges for a 20-ton load assumed to occupy an area of 8 feet by 15 feet, together with a uniform load of 60 pounds per square foot on the remaining floor area. These loadings are also recommended to the counties.

The initial organization of the California Highway Commission did not include a bridge department, so that when bridge work began to develop, it fell to the lot of the office engineer at the headquarters office to carry it on. This arrangement has continued to date, and a squad organization in the headquarters office has developed as a result, with an assistant engineer and from two to three draftsmen almost constantly employed on bridge work. From its nature, the bridge work has called for a greater proportion of the time of the office engineer than has the regular highway work, which is more routine in its nature.

Since the work started, nearly two hundred fifty sets of plans for county bridges have been checked and over one hundred structures have been designed by the Highway Commission forces. All of the checking has been done in the headquarters office. A few of the designs have been made in the various division offices and reviewed by the headquarters office, but the greater part of the designing has been done at headquarters. Seventy structures, other than short-span bridges and culverts built from standard plans have been built or are being constructed under the direct control and supervision of the California Highway Commission. In a number of cases, the commission has furnished inspectors for bridges built by the counties. The construction work is carried on by the same division organizations which handle the road work. The commission has furnished plans and handled construction for bridges paid for wholly by counties and jointly by the state and counties. It has handled construction for the counties at their expense and from plans furnished by them. It has furnished plans and specifications from which counties have built the bridges. The total cost of bridges constructed under the direct supervision of the commission amounts to nearly $1,400,000.

Short descriptions of a number of bridges of various types constructed on the state highways since 1912 follows:

Yolo Causeway.

This consists of 2,432 feet of wooden trestle on creosoted piles and 14,106 feet of concrete trestle including a bascule span of 80 feet clear channel, a total length of structure of 16,538 feet or 3.13 miles. The work was completed in 1916. Designed and constructed by California

Highway Commission. Cost $433,000. Entire cost paid by state. The concrete trestle was constructed by the unit method. The bascule span is of an unpatented type. See Plates XLIII and XLIV.

Eel River, South of Scotia, Humboldt County.

Two steel spans of 302.5 feet and six concrete approach spans of 46 feet each. Completed 1916. Designed and built by California Highway Commission. Cost $121,000. Cost paid jointly by Humboldt County and state. See Plate LI.

Rock Creek, Mendocino County.

A three-hinged timber arch span of 150 feet. Completed 1916. Designed and built by California Highway Commission. Cost partly paid by Mendocino County. A structure designed to meet special conditions, erected by a cableway, and built of redwood timber. See Plate LII.

Pit River, Shasta County.

A reinforced concrete arch span of 242 feet. Completed 1916. Designed and built by California Highway Commission. Cost $37,000. Cost partly paid by Shasta County. The longest concrete span in California. See Plate XLV.

Sacramento River at Dunsmuir, Siskiyou County.

A reinforced concrete arch bridge, one span of 180 feet and two spans of 114 feet. Completed 1916. Designed for Siskiyou County by A. V. Saph. Built by California Highway Commission. Cost $45,000. Cost paid entirely by Siskiyou County. See Plate XLVI.

Putah Creek, on Line Between Yolo and Solano Counties.

Two spans of 150 feet, three hinged reinforced concrete arches. Completed 1916. Designed by F. A. Steiger for Yolo and Solano counties, and built by the two counties at their expense. See Plate XLVII.

Petaluma Creek, on Line Between Sonoma and Marin Counties.

A bascule bridge with 120 feet clear channel. Completed 1917. Designed and built by California Highway Commission. Cost $102,000. Paid for out of fund contributed by Napa, Sonoma and Marin counties and the state for building the "Black Point Cut-off." The bascule is of a type not covered by patents. See Plate XLVIII.

Pajaro River, on Line Between Santa Clara and San Benito Counties.

A steel bridge with concrete floor, one span of 200 feet. Completed 1915. Designed by A. M. McCray for San Benito and Santa Clara counties, and built by the two counties at their expense. See Plate XLIX.

Yuba River at Marysville, Yuba County.

A reinforced concrete girder bridge having 40 spans of 50 feet each. Completed 1916. Designed by Reynolds & Whitman for Yuba County and built by the county. See Plate L.

Arroyo Quemado, Santa Barbara County.

A reinforced concrete arch with two spans of 109 feet. Completed 1917. Designed by Mayberry & Parker and F. L. Johnston for Santa Barbara County and built by the county. See Plate XXV.

Santa Ynez River, Santa Barbara County.

A steel bridge with concrete floor having seven steel spans of 162 feet and concrete approaches. Completed 1918. Designed by A. V. Saph for the California Highway Commission. Built by the California Highway Commission. Cost $175,000. Santa Barbara County paid part of cost. See Plate XXVI.

South Fork of Santa Clara River, Los Angeles County.

A steel plate girder bridge with concrete floor, four spans of 60 feet. Completed 1916. Designed and built by Los Angeles County. This type is more usual on railroads than highways. See Plate LIII.

Santa Clara River, Los Angeles County.

A steel truss of 200 feet span, with concrete floor. Completed 1916. Designed and built by Los Angeles County. This is a typical modern steel bridge designed for the heaviest traffic. See Plate LIV.

Stony Creek, Glenn County.

An earth-filled arch bridge of 13 spans carrying from 70 to 100 feet. Built by Glenn County. Completed 1914. A typical earth-filled arch bridge. See Plate LV.

The foregoing bridges do not constitute a complete list of even the larger bridges, but are examples of the types which may be considered standard construction. A small number of bridges of unusual types have been constructed. The prevailing type of bridge on the state highways is the short span reinforced concrete girder.

As mentioned before, the several counties have assisted in the construction of the state highways by constructing a large number of bridges. On the whole, the results of this co-operation have been fairly satisfactory, but in some instances a disposition to build bridges according to the practices prevalent before the development of present-day traffic conditions has manifested itself. In a few cases, it has been impossible to prevail upon those responsible to change their ideas and build for present-day traffic, with the result that there are some new bridges on the line of the state highways which are not up to the usual standard. While these have never been officially taken over as part of the state highways and the commission disclaims responsibility for them, yet they constitute a part of the traffic route and may easily become a source of embarrassing controversies in the future.

The practice in checking county designs has necessarily been confined to passing upon the structural strength of the proposed bridges and the adequacy of foundations and waterway. Even though the appearance of the structure might not be entirely satisfactory or the design might obviously involve unnecessary expense, the fact that the bridges were obtained at all only by the voluntary co-operation of the counties and the necessity for sparing local feelings made it impossible to take up such points except in the few cases where advice was asked for.

Some practices have appeared which were open to criticism. One of these was the method of calling for plans for a bridge from anyone who wanted to volunteer them. The usual result was that a number of ill-digested designs were presented, the better bridge engineers did not appear at all, and the best salesman rather than the best engineer got the job. Another result was the attempt to develop special designs with catchy talking points or patented details and to push them whether or not suitable for the place. This practice at times caused the staff of the California Highway Commission much unnecessary work and embarrassment. Another cause for poor designs has appeared in the thoughtless habit of some boards in not allowing adequate time for their engineers to prepare plans. Plans can be turned out overnight in an emergency, but something is always sacrificed in so doing.

The contact with the methods of handling bridge work in the several counties has brought forcibly to mind the fact that each county is a law unto itself in the kind of bridges it builds. It would appear that the public interest and safety would be promoted if legal authority were lodged in some branch of the Department of Engineering to prescribe and enforce general standards of construction; to review plans and specifications and see that they were adequate and the designs safe and economical; to compel proper inspection during construction; to prepare designs, if requested, on such terms of compensation that it would compete with the engineer in private practice only on the basis of quality of work; and to exercise the power of condemnation of unsafe structures should the local authorities fail to act.

APPENDIX M.

MINT CANYON ROAD IN LOS ANGELES COUNTY.

[Excerpt from minutes of California Highway Commission, March 20, 1917, p. 3552.]

"A letter from A. J. Hill, County Counsel of Los Angeles County, was read dated Los Angeles, Cal., March 7, 1917, accompanying a resolution of the Board of Supervisors passed March 7 asking the state to take over and maintain the Mint Canyon road as a state highway, and it was

"*Voted*, That the following reply be made by the secretary:

"*The Honorable Board of Supervisors of Los Angeles, Cal.*

"GENTLEMEN:

"The California Highway Commission acknowledges the receipt of a resolution of your board adopted March 7, 1917, reading as follows:

" 'WHEREAS, The county of Los Angeles has entered into contracts in the sum of three hundred fifty thousand dollars ($350,000.00) for the construction and improvement of the Mint Canyon road; and

" 'WHEREAS, The present conditions of the county finances are such that such contracts can not be completed or such road constructed; and

" 'WHEREAS, The people of the state of California recently voted a bond issue in the sum of fifteen million dollars ($15,000,000), a portion of which is to be used in the construction of a road between the city of Los Angeles and the Antelope Valley by the most practical route; and

" 'WHEREAS, Only a portion of the cost of such Antelope Valley road is by law to be paid from state funds, the balance being contributed from county funds; and

" 'WHEREAS, Certain work has been done on the said Mint Canyon road by the county of Los Angeles, which work would, we believe, be accepted by the state of California as the contribution of Los Angeles County, leaving the sole cost of the completion of said road and bridges on said Mint Canyon road, to be borne by the state of California alone; and

" 'WHEREAS, The cost of the completion of said Mint Canyon road is such that more money will be available for the construction by the state of the road to Imperial Valley and other roads; and

" 'WHEREAS, The construction of said road is highly important to the county of Los Angeles; and

" 'WHEREAS, The taking over by the state of California of the Mint Canyon road would relieve the county of Los Angeles of its obligations on the three hundred fifty thousand dollars ($350,000.00) of contracts, and would result in the immediate completion of said road, thereby giving a paved highway to the citizens of the Antelope Valley; and

" 'WHEREAS, The building of said road by the state of California would save the taxpayers of Los Angeles County more than four hundred thousand dollars ($400,000.00); now, therefore,

" '*Be it resolved*, That the state of California be requested to construct and maintain said Mint Canyon road as a state highway.

" '*Provided, however*, that the adoption of this resolution shall not be understood or construed as waiving, directly or indirectly, the right of this board or the county of Los Angeles, to our share of the state license tax on automobiles, nor the right to demand any portion of the proceeds of the state highway bond issue for the purpose of constructing and improving the Arroyo Seco road and other roads in this county.'

"After careful consideration of the foregoing I am directed to reply that the commission will lay out and take over as a state highway the so-called Mint Canyon road from Saugus to Palmdale, complete its construction and maintain it on the understanding that said road is the road referred to in section 4 of the State Highways Act of 1915 in the following language:

> 'an extension connecting Antelope Valley in the county of Los Angeles, with the city of Los Angeles, by the most direct and practical route';

"*Provided, however*, that the county of Los Angeles shall secure and pay for all rights of way heretofore under negotiation; *and provided, further*, that the county shall be responsible for all obligations growing out of any pending and

> existing contracts for the construction of portions of said Mint Canyon road or arising out of any other contracts relating to work or materials for such construction, and shall hold the state harmless from any claims or complications arising out of any such contracts, it being the intention hereof that the county shall cancel or otherwise terminate any such pending and existing contracts and shall be responsible for all valid claims arising on said contracts."

Pursuant to the foregoing vote, the commission has constructed 10.6 miles of concrete pavement between Seeley's ranch and a point two miles north of Acton. Northerly from this point for nearly two miles the rough grading has been done and culverts completed.

Plans for a reinforced concrete bridge across the Santa Clara River have been approved and the work is about to be advertised.

The work remaining to be done on this road consists in the grading and paving of approximately 8.6 miles south of Palmdale and 1.9 miles at the Santa Clara River, including the proposed bridge.

APPENDIX N.

CALIFORNIA HIGHWAY COMMISSION.

Forum Building, Sacramento.

June 5, 1918.

Marshall De Motte, Esq.,
Chairman, State Board of Control,
Sacramento, California.

My dear Mr. De Motte:

In response to your inquiry of last week I have had tabulated the cement purchases of the California Highway Commission from the year 1912 to date, and I am attaching hereto a copy of the tables.

The purchases in each year are shown separately, and I have tried to make the tables explain themselves.

The compilation of the figures has been a considerable task, but I believe the tables to be without essential error. In arriving at the mill base price, all possible available data as to freight rates were used. Only in rare cases does the commission see the freight bills actually paid by the cement companies.

A recapitulation sheet is also attached.

In the year 1912, almost at the beginning of the actual work of the commission, an attempt was made during conferences at which practically all of the cement companies were represented to fix a mill base price for the cement required for the state highway to be built. It was represented by the commission that the general adoption of the concrete type of pavement would depend largely on the price which the state would have to pay for the cement.

After much discussion the cement companies concluded that they would not or possibly could not make such a contract with the commission and stipulated that bids should be called for for the cement needed for each particular section of highway placed under contract, they to bid on the cement at point of delivery (nearest freight station to point of use) and not at the mill, but they agreed orally that the price during the life of the work should not exceed the sum of $1.40 per barrel at the mill.

The price for the sacks was to be added to the bid price, with, of course, the usual rebate on the return of the sacks to the mill.

Until the spring of the year 1917 the cement companies kept their agreement absolutely as the tables show.

Since then, without previous notification, the mill base price has advanced in some cases to $1.50 and sporadically also the companies have made further advances.

An officer of one of the companies stated, when asked the reason for the increased mill base price, that the companies considered that the oral agreement was nullified when the $18,000,000 fund was exhausted and the request of the commission that the agreement should be held to include the duration of the state highway constructive period was not granted.

As stated, the agreement was only an oral one and there is room for argument as to when it should terminate.

During the active period when the arrangement was adhered to fully (1912 to 1916 inclusive), the commission paid an average mill base price of about $1.33 per barrel.

During the whole period, 1912 to April, 1918, the average mill base price paid for cement delivered was $1.345 per barrel, but this average price will be greater when all the 1917 and 1918 purchases are delivered.

It is understood now that so far as the northern mills are concerned the price will be $1.95 mill base because of the price established by the United States Government. The Colton mill (California Portland Cement Company), in southern California, however, on April 15, 1918, established a mill base price of $1.63 per barrel on an estimated requirement of 310,000 barrels, and doubtless this company will receive the commission's business wherever the freight rates will permit.

In comparing the prices paid by the California Highway Commission at points of delivery where used with those paid by other departments of the state and by counties and municipalities, it must not be forgotten that the California Highway Commission, during the whole period under discussion, has enjoyed special freight rates established by the several railroads. The commission has paid one-half ($\frac{1}{2}$) the "class rate" when the class rate was less than the "commodity" rate or a combination of the class rate and the commodity rate, and in any event the lowest rate obtainable under the combination of class and commodity rates.

This special arrangement has resulted in a saving to the state of possibly 40 per cent over the rates paid by the general public.

The business relations between the commission and the companies have been satisfactory in all respects and it is a pleasure to be able to say that although the cement was rigidly inspected at the mill, at the commission's laboratory, and in the field, of the total delivery of nearly one and three-quarter million barrels during the years 1912–1917 inclusive, not a single barrel could be condemned because of failure to comply with the specifications.

Yours very truly,

A. B. FLETCHER,
Highway Engineer.

STATE OF CALIFORNIA,

DEPARTMENT OF ENGINEERING, CALIFORNIA HIGHWAY COMMISSION.

Recapitulation of Analyses of Cement Purchases for the Years 1912 to 1917, and a Portion of 1918.

Year	Total deliveries (barrels)	Total cost at mills	Average mill base
1912	142,465.50	$176,683 21	$1 240
1913	242,514.50	317,376 36	1 309
1914	677,790.25	898,403 48	1 325
1915	355,005.50	485,267 31	1 367
1916	110,090.00	150,958 28	1 371
1917	220,794	321,064 61	1 454
1918	31,552	44,995 75	1 426
	1,780,211.75	$2,394,749 03	$1 345

State of California

California Highway Commission

ANALYSIS OF CEMENT PURCHASES IN YEAR 1912

Cont. No.	Date of Award	Quantity Bid On	Delivery Points	BIDDERS								Quantities Delivered	Mill Base	Cost at Mill
				1	2	3	4	5	6	7	8			
5	Aug. 27	13,000 Bbls.	Ceres	$1.84	$1.44*					$1.20+		15,293 Bbls.	$1.20	$ 18,351.60
6	" 27	12,220 "	Livingston	1.88	1.475*					1.20+		12,467 "	1.205	15,022.74
7	" 27	10,725 "	Encinitas	2.16				$1.50		1.60*		8,845 "	1.20	10,614.00
8	" 27	12,150 "	Herndon	1.97*	1.57					1.20+		13,315 "	1.20	15,978.00
9	" 27	12,365 "	Borden	1.95*	1.55					1.20+		12,444 "	1.20	14,932.80
10	" 27	8,670 "	McNear	1.94'	1.53*					1.20+		9,112 "	1.20	10,934.40
11	Oct. 16	14,110 "	Atwater	1.67*	1.68							15,068 "	1.37	20,643.16
12	" 16	2,350 "	Roseville	1.56	1.55*							2,384 "	1.30	3,099.20
13	" 16	12,810 "	Andora	1.64	1.63*							14,108.50 "	1.31	18,482.14
15	" 16	8,990 "	Sunnyvale	1.64*	1.69							9,360. "	1.34	12,542.40
16	" 16	18,205 "	Healdsburg	1.83	1.82*							22,390 "	1.20	26,868.00
17	" 16	9,560 "	Garnsey					1.50+		1.58*		7,679 "	1.20	9,214.80
												142,465.50 "	Av. $1.240	$176,683.24

* Successful Bidder
+ Mill base price. Delivered price not now readily obtainable.

	NAME	LOCATION OF MILL	ADDRESS
1	Henry Cowell Lime & Cement Company	Cowell, Cal.	#2 Market Street, San Francisco
2	Pacific Portland Cement Company, Cons.	Cement, Cal.	Pacific Building, San Francisco
3	Santa Cruz Portland Cement Company	Davenport, Cal.	Crocker Building, San Francisco
4	Standard Portland Cement Corporation	Napa Junction, Cal.	Crocker Building, San Francisco
5	California Portland Cement Company	Colton, Cal.	Douglas Building, Los Angeles
6	Golden State Portland Cement Company	Oro Grande, Cal.	321 Henne Building, Los Angeles
7	Riverside Portland Cement Company	Crestmore, Cal.	Title Insurance Building, Los Angeles
8	Southwestern Portland Cement Company	Victorville, Cal.	607 H. W. Hellman Building, Los Angeles

State of California

California Highway Commission

ANALYSIS OF CEMENT PURCHASES IN YEAR 1913

Cont. No.	Date of Award	Quantity Bid On	Delivery Points	BIDDERS 1	2	3	4	5	6	7	8	Quantities Delivered	Mill Base	Cost at Mill
2		160 Bbls.	Cloverdale											
20		87.5 "	Willits											
21	Mar.11,'13	12,950 "	Reseda					$1.92		$1.77*		9,488 Bbls.	$1.37	$ 12,998.56
23	Apr.22,'13	16,490 "	Morgan Hill	$1.59	$1.52*	$1.63						17,990 "	1.18	21,228.20
25	Mar.26,'13	12,370 "	Modesto	1.59*	1.59			1.50+		2.10		12,680 "	1.35	17,118.00
26		2,675 "	Colma	1.49	1.48*	1.59						2,375 "	1.20	2,850.00
28		6,110 "	Mulia	1.53	1.52*	1.63						5,450 "	1.31	7,139.50
30	June 26,'13	13,130 "	Encinitas							1.73*		13,847 "	1.30	18,001.10
31	June 30,'13	9,440 "	Camarillo	2.04	2.08			1.50+		1.84*		10,537.5 "	1.29	13,593.38
32	June 15,'13	1,950 "	Santa Clara		1.55*					2.03		1,920 "	1.34	2,572.80
33	June 26,'13	14,950 "	Owensmouth							1.80*		18,440 "	1.30	23,972.00
34	July 30,'13	900 "	Baden	1.86	1.45*	1.54	1.56			2.03		1,331 "	1.16	1,543.96
35	Aug.14,'13	9,400 "	Gilroy	1.96	1.54*	1.54	1.66			2.20		11,050 "	1.17	12,928.50
36	Aug.14,'13	15,930 "	Los Alamos	2.35	1.88*	1.97	2.02			2.29		19,227 "	1.25	24,033.75
37	Sept.25,'13	10,130 "	Pomona					1.50+		1.69*		10,383.5 "	1.40	14,536.90
38	Sept.29,'13	8,950 "	Rialto	2.00		2.19	2.16	1.50+		1.56*		9,407.5 "	1.39	13,076.43
39	Sept.25,'13	10,230 "	Oceanside	1.81		2.27	2.27			1.73*		11,121 "	1.40	15,569.40
40	Sept.23,'13	17,220 "	Anaheim	1.77		1.94	2.06			1.63*		18,035 "	1.40	25,249.00
41		540 "	Salinas	1.69	1.62*	1.62	1.74					630 "	1.17	737.10
42	Sept.25,'13	625 "	San Juan Bautista	1.64	1.58*	1.63	1.77					915 "	1.17	1,070.55
43		14,290 "	Wineville	1.75						1.51		15,065 "	1.40	21,091.00
45	Nov.17,'13	1,890 "	Carpinteria	1.82	1.70*	1.82				1.97		2,448 "	1.13	2,766.24
46	Dec.30,'13	16,250 "	Upland	1.88						1.53*		16,610 "	1.40	23,254.00
47	Nov.21,'13	13,450 "	Calwa	1.63*	1.67	1.74	1.74					13,605 "	1.24	16,870.20
48	Nov.21,'13	10,650 "	Selma	1.65	1.62*	1.74	1.74					10,430 "	1.22	12,724.60
D-2	Oct.6,'13	212 "	Shingle Spgs	1.70*	1.76	1.92	1.75					212 "	1.16	245.92
D-3	Sept.12,'13	8,710 "	Sta.Margarita	1.90	1.88*	1.93	1.95			2.30		9,317 "	1.31	12,205.27
												242,514.5 Bbls.		$317,376.36
												Average Mill Base	1.309	

* Successful Bidder

+ Mill base price. Delivered price not now readily obtainable.
For key to bidders see "Analysis of Cement Purchases in Year 1912".

State of California

California Highway Commission

ANALYSIS OF CEMENT PURCHASES IN YEAR 1914

Cont. No.	Date of Award	Quantity Bid On	Delivery Points	BIDDERS								Quantities Delivered	Mill Base	Cost at Mill
				1	2	3	4	5	6	7	8			
49	Mar.2	1,180 Bbls.	Glenwood	$1.52	$1.52	$1.37*						700 Bbls.	$1.20	$ 840.00
50	" 2	13,100 "	Bakersfield	1.68	1.68		$1.63			$1.63*		14,220 "	1.04	14,788.80
51	" 2	11,370 "	Lerdo	1.66	1.66		1.61*			1.61		13,495 "	1.18	15,924.10
52	" 2	14,425 "	Ventura	1.70	1.70	1.70*				1.71		20,480 "	1.18	24,166.40
53	" 2	2,740 "	Upland	1.93						1.48*		3,340 "	1.40	4,676.00
54	" 2	9,060 "	Baden	1.44	1.44		1.40*					9,765 "	1.18	11,522.70
55	Nov.17	11,750 "	Atascadero		1.84*					1.97		11,485 "	1.27	14,585.95
56	" 17	14,000 "	Paso Robles		1.73*					2.01		16,043 "	1.27	20,374.61
57	Apr.20	420 "	Ridgewood	2.33	2.33		2.28*					230 "	1.40	322.00
58	Mar.2	15,200 "	Las Flores	1.89						1.73*		16,010 "	1.35	21,613.50
59	Apr.20	2,525 "	La Mesa					$1.93		1.83*		2,790 "	1.40	3,906.00
60	May 1	340 "	South Fork	2.16*								340 "	1.40	476.00
61	Apr.20	5,450 "	Haywards	1.60	1.57*		1.59					5,875 "	1.40	8,225.00
62	" 20	800 "	Haywards	1.60	1.57*		1.59					1,560 "	1.40	2,184.00
63	" 20	16,000 "	Delano	1.82*	1.86		1.85	2.01		1.91		17,375 "	1.40	24,325.00
65	June 11	930 "	Sausilito	1.68	1.68		1.63*					555 "	1.40	777.00
66	" 11	640 "	Hornbrook	2.09	2.10		2.04*					840 "	1.40	1,176.00
67	" 11	16,800 "	Kern	1.83*	1.88	1.97		1.94		1.94		17,440 "	1.40	24,416.00
68	" 11	1,000 "	Cloverdale	1.91	1.90		1.86*					735 "	1.40	1,029.00
69	Apr.20	18,170 "	Merced	1.69	1.69		1.65*					20,240 "	1.40	28,336.00
70	June 24	14,640 "	Chico	1.74*	1.76	1.88		1.40+				19,250 "	1.40	26,950.00
71	" 11	468 "	South Fork	2.21	2.20		2.16*					628 "	1.26	791.28
72	" 11	7,880 "	Gilroy	1.76	1.72	1.63*						8,505 "	1.40	11,907.00
73	Apr.20	6,050 "	Sea Cliff					1.97		1.89*		9,157 "	1.32	12,087.24
74	June 11	11,980 "	Vacaville	1.59	1.49*		1.54					11,827.50 "	1.40	16,558.50
75	" 24	890 "	La Moine	2.05	2.02		2.00*	1.40+				1,300 "	1.40	1,820.00
76	" 24	11,500 "	Corning	1.84	1.82		1.79*					11,390 "	1.40	15,946.00
77	" 24	8,600 "	Orland	1.84	1.82		1.79*	1.40+				9,570 "	1.40	13,398.00
78	" 11	14,825 "	Lancaster					1.82*		1.83		14,825 "	1.35	20,013.75
79	Apr.20	13,480 "	Benecia	1.49	1.46*		1.49					14,315 "	1.40	20,041.00
80	June 11	14,120 "	Arbuckle	1.75			1.69*					16,845 "	1.39	23,414.55
81	July 7	12,360 "	Camarille		1.99	1.85		1.85*				12,890 "	1.385	17,852.65
82	" 7	15,200 "	Davis	1.59	1.54*	1.68						16,908 "	1.40	23,671.20
83	" 7	1,000 "	Santa Cruz	1.64	1.60	1.46*						1,210 "	1.40	1,694.00
84	" 7	18,150 "	San Luis Obispo	1.83	1.83	1.78*						20,445 "	1.40	28,623.00
85	" 7	1,950 "	Redding	1.89*	1.93	2.03						1,940 "	1.35	2,619.00
86	June 11	29,600 "	Webster	1.64	1.55*		1.59					32,435 "	1.36	44,111.60
87	Aug.12	6,050 "	Ukiah	2.07	2.07		2.05*					6,665 "	1.38	9,197.70
88	Nov.24	6,500 "	San Jose	1.26*	1.56		1.60					6,690 "	1.10	7,359.00
89	Aug.12	11,740 "	Milpitas	1.55	1.55*		1.58					11,350 "	1.40	15,890.00
90	" 12	6,650 "	Livermore	1.60	1.60		1.58*					8,175 "	1.32	10,791.00
91	" 12	250 "	San Pablo	1.43*	1.49		1.51					260 "	1.30	338.00
92	" 12	1,600 "	Gaviota	1.92	1.92*		1.95	2.09				1,940 "	1.35	2,619.00
93	" 12	450 "	South Fork	2.13	2.14		2.11*					450 "	1.35	607.50
94	July 7	2,030 "	El Cajon					1.86*				2,099 "	1.40	2,938.60
88	Aug.12	4,200 "	San Jose				1.54*					5,190 "	1.38	7,152.20
											Forwarded	419,777.50 "		$562,055.83

State of California

California Highway Commission

ANALYSIS OF CEMENT PURCHASES IN YEAR 1914 (Cont.)

Cont. No.	Date of Award	Quantity Bid On		Delivery Points	BIDDERS 1	2	3	4	5	6	7	8	Quantities Delivered		Mill Base	Cost at Mill
										Brought Forward			419,777.50	Bbls.		$562,055.83
95	July 7	7,410	Bbls.	Orcutt	$1.96•	$2.00	$2.00						7,990	•	$1.40	11,186.00
96	• 8	23,365	•	Conner	2.03	2.02		$1.98•	$2.00				25,600	•	1.40	35,840.00
97	Aug.12	12,420	•	Galivan					1.71•		1.72		12,905	•	1.32	17,034.60
98	Sept.11	9,950	•	Santa Ana					1.62		1.53•		11,150	•	1.20	13,380.00
99	• 11	17,550	•	Colusa	1.65•	1.67		1.80					19,480	•	1.20	23,376.00
100	Oct. 6	900	•	Sisson	2.04	2.02•		2.06					900	•	1.32	1,188.00
101	Aug.24	460	•	Castaic					1.76		1.66•		500	•	1.40	700.00
102	Oct. 6	1,200	•	Los Gatos	1.65	1.66	1.63•						1,520	•	1.40	2,128.00
103	• 6	900	•	Port Costa	1.45•	1.51		1.51					995	•	1.40	1,393.00
104	Aug.12	240	•	Shiveley	2.03	2.07		2.01•					375	•	1.40	525.00
105	Oct. 6	198	•	Beatrice	1.87	1.90		1.84•					215	•	1.40	301.00
106	Sept.11	500	•	Bakersfield	1.64	1.81		1.63•	1.93				1,002	•	1.40	1,402.80
107	Aug.12	8,480	•	Coyote Wells					2.16•		2.17		10,125	•	1.34	13,567.50
108	Oct. 6	7,800	•	Altamont	1.60	1.59•		1.66					9,600	•	1.36	13,056.00
109	Sept.11	1,940	•	Goleta	1.72•	1.77	1.92		1.80		1.78		5,705	•	1.20	6,846.00
110	Oct. 6	875	•	San Luis Obispo	1.76	1.80	1.78•				1.78		1,205	•	1.21	1,456.05
•111	Sept.11	10,600	•	Vacaville	1.34	1.31•		1.44					12,610	•	1.15	14,501.50
112	• 11	7,350	•	Folsom	1.41	1.58		1.40•					8,425	•	1.14	9,604.50
113	Oct. 6	11,400	•	Willows	1.50•	1.77		1.81					11,765	•	1.12	13,176.80
114	Nov.12	11,100	•	Cordelia	1.56	1.48•		1.50					11,150	•	1.40	15,610.00
115	Oct.6	6,910	•	Gaviota	1.66•	1.94	1.92				2.18		8,225	•	1.14	9,376.50
116	Nov.12	15,000	•	Coyote Wells					2.20		2.167•		15,585	•	1.37	21,351.45
117	• 12	10,375	•	Colusa	1.81	1.81		1.80•					13,405	•	1.37	18,364.85
118	Dec.23	1,500	•	Yreka	2.18•	2.19		2.22					1,787	•	1.37	2,448.19
119	• 23	6,400	•	San Juan Capistrano					1.74•		1.77		7,470	•	1.36	10,159.20
120	• 23	890	•	Castaic					1.78•		1.81		1,000	•	1.35	1,350.00
126	Sept.11	4,280	•	Wheatland	1.45	1.62		1.44•					4,600	•	1.28	5,888.00
154	• 11	13,400	•	Atascadero	1.73	1.91	1.72•						13,718.75	•	1.39	19,069.06
D-4		170	•	Ridgewood		2.12•							170.00	•	1.17	198.90
D-5	Mar. 2	585	•	El Dorado	1.51	1.51		1.46•					8,800.00	•	1.05	9,240.00
D-7	Aug.27	7,650	•	Niles	1.54	1.54		1.52•					13,045	•	1.35	17,610.75
D-8	• 7	5,600	•	Betabel	1.79	1.74	1.63•						7,755	•	1.48	11,477.40
D-15	Oct. 6	6,035	•	West Napa	1.57	1.55		1.48•					7,620	•	1.48	11,277.60
D-36	June 11	1,600	•	Sausilito				1.63•					1,615	•	1.40	2,261.00
													677,790.25	•	Av.$ 1.325+	$898,403.48

- • Successful Bidder
- + Mill base price. Delivered price not now readily obtainable.
  For key to bidders see "Analysis of Cement Purchases in Year 1912".

State of California

California Highway Commission

ANALYSIS OF CEMENT PURCHASES IN YEAR 1915

Cont. No.	Date of Award	Quantity Bid On	Delivery Points	Bidders 1	2	3	4	5	6	7	8	Quantities Delivered	Mill Base	Cost at Mill+
121	Feb.9,'15	15,500 Bbls.	Yuba City	$1.66	$1.65		$1.64•					16,420 Bbls.	$1.37	$22,495.40
122	Feb.9,'15	21,100 •	Nelson	1.70•	1.71		1.72					21,875 •	1.34	29,312.50
123	Apr.7,'15	780 •	Serra					$1.73•		$1.73		4,845 •	1.35	6,540.75
124	Apr.7,'15	9,400 •	Davis		1.53•		1.55					12,992 •	1.36	17,669.12
125	Apr.7,'15	7,000 •	Traver		1.77		1.76•					7,370 •	1.28	9,433.60
126	Apr.7,'15	10,840 •	Goshen Jct.		1.79		1.78•					11,967 •	1.28	15,317.76
127	Apr.7,'15	6,000 •	Sacramento		1.59•		1.61					4,135 •	1.40	5,789.00
127			Mikon	1.67•	1.59		1.61					1,610 •	1.40	2,254.00
129	May 11,'15	9,700 •	Petaluma	1.60	1.59•	$1.69						11,397 •	1.39	15,841.83
130	May 11,'15	5,000 •	San Pablo	1.50•	1.55	1.61						7,945 •	1.37	10,884.65
131	May 11,'15	6,400 •	Salinas	1.74	1.84	1.72•						7,050 •	1.31	9,235.50
132	May 11,'15	14,350 •	San Ardo	1.91	2.03	1.69•						14,140 •	1.39	19,654.60
133	May 11,'15	9,400 •	King City	1.87	1.98	1.64•						13,230 •	1.39	18,389.70
134	June 3,'15	5,640 •	Saugus					1.70		1.68•		6,045 •	1.34	8,100.30
135	June 3,'15	8,450 •	Red Bluff	1.86	1.84•		1.86					9,265 •	1.36	12,600.40
136	June 15,'15	446 •	Scotia	2.21•	2.23	2.22						446 •	1.40	624.40
137	June 15,'15	6,140 •	Chualar	1.90	1.88	1.74•						14,670 •	1.40	20,538.00
138	June 3,'15	11,700 •	Hanford	1.78•	1.80		1.80					12,840 •	1.40	17,976.00
139	June 15,'15	14,000 •	Colusa Jct.	1.76	1.74•	1.76						14,412.50 •	1.36	19,601.00
140	July 30,'15	12,200 •	Willows	1.78	1.78		1.76•					12,260 •	1.38	16,918.80
141	July 30,'15	570 •	Tormey	1.48•	1.54		1.51					605 •	1.35	816.75
142	June 3,'15	1,050 •	Red Bluff	1.86	1.84•		1.86					855 •	1.36	1,162.80
143	July 30,'15	9,600 •	Livermore	1.63	1.61•		1.62					10,445 •	1.39	14,518.55
144	July 27,'15	2,900 •	Herault	2.09•	2.12		2.11					3,035 •	1.39	4,218.65
145	July 27,'15	570 •	Gibson	2.01•	2.03		2.02					400 •	1.36	544.00
146	July 30,'15	15,700 •	W.San Jose	1.66	1.65		1.60•					15,975 •	1.37	21,885.75
147	July 30,'15	7,000 •	Montrose					1.68		1.66•		7,393 •	1.35	9,980.55
148	June 15,'15	5,000 •	Goshen	1.78•	1.80	1.80						4,560 •	1.36	6,201.60
149	July 30,'15	8,600 •	Visalia	1.82	1.80•		1.82					11,365 •	1.28	14,547.20
150	Aug.19,'15	350 •	Ignacio	1.64•	1.68	1.65						275 •	1.39	382.25
152	Aug. 19,'15	14,940 •	Soledad	1.80	1.96	1.77•						16,275 •	1.39	22,623.25
153	Aug. 19,'15	2,320 •	Zaca	1.98•	2.02	2.00						1,795 •	1.40	2,513.00
155	July 27,'15	2,860 •	Dunsmuir	2.03•	2.05		2.04					3,215 •	1.36	4,372.40
156	Nov 20,'15	12,300 •	Wheatland	1.67	1.66		1.64•					11,970 •	1.38	16,518.60
157	Nov. 20,'15	1,272 •	Planada	1.63•	1.70		1.70					1,252 •	1.40	1,752.80
158	Nov. 20,'15	310 •	Fairville	1.66	1.64•		1.65					250 •	1.40	350.00
159	Nov. 20,'15	1,250 •	Coyote Wells					2.22		2.20•		2,030 •	1.38	2,801.40
160	Dec. 13,'15	1,000 •	Mikon	1.71	1.59•		1.62					1,000 •	1.40	1,400.00
161	Dec. 13,'15	15,150 •	Dixieland					2.37		2.20•		15,390 •	1.40	21,546.00
D-19	1915		Serra					1.73•				7,956 •	1.35	10,740.60
D-39	Dec. 15,'15	1,089 •	Sargent	1.65•	1.74	1.63						805 •	1.30	1,046.50
D-50	July 29,'15	16,000 •	Riverbank	1.59•	1.63		1.66					14,580 •	1.40	20,412.00
D-48	1915		Betabel		1.53•							12,385 •	1.39	17,215.15
D-38	1915	1,025 •	Claremont					1.515•				1,165 •	1.36	1,584.40
M.P-155	July 12,'15	5,900 •	Ben Ali	1.59•								5,115 •	1.36	6,956.40
												355,005.50 •	Av. $1.367	$485,267.31

• Successful Bidder
+ Mill base price. Delivered price not now readily obtainable.
For key to bidders see "Analysis of Cement Purchases in Year 1912"

State of California

California Highway Commission

ANALYSIS OF CEMENT PURCHASES IN YEAR 1916

Cont. No.	Date of Award	Quantity Bid On	Delivery Points	BIDDERS 1	2	3	4	5	6	7	8	Quantities Delivered	Mill Base	Cost at Mill
162	Jan. 11, '16	14,020 Bbls.	Tehama	$1.82	$1.82		$1.80•					13,490 Bbls.	$1.354	$ 18,265.46
167	July 11, '16	11,900 "	Redwood City	1.61	1.65		1.59•					13,065 "	1.37	17,899.05
171	July 31, '16	7,570 "	El Rio		2.00					$1.80•		7,790 "	1.29	10,059.10
177	Oct. 13, '16	550 "	Santa Rosa		1.63•							405 "	1.39	562.95
163	Jan. 11, '16	3,150 "	Black Point	1.64•	1.56		1.68					4,285 "	1.40	5,999.00
176	Oct. 13, '16	1,850 "	Zaca		1.98•	$2.04				2.24		3,606 "	1.40	5,048.40
164	Jan. 11, '16	6,630 "	New Castle	1.71	1.68•		1.73					8,925 "	1.395	12,450.38
165	Apr. 3, '16	1,000 "	Andora Sub.	1.65	1.63•		1.65					970 "	1.40	1,358.00
166	May 6, '16	6,500 "	Scotia	2.09•	2.12		2.11					6,360 "	1.40	8,904.00
168	Jan. 11, '16	10,000 "	Rocklin	1.71	1.68•		1.65					8,270 "	1.35	11,164.50
169	Jan. 11, '16	6,180 "	Beatrice	2.09	2.10		2.07•					6,610 "	1.395	9,220.95
170	July 11, '16	5,800 "	Stege	1.53•	1.54		1.56					5,665 "	1.39	7,874.35
172	July 31, '16	1,650 "	Lymann	1.77•	1.80		1.79					1,555 "	1.39	2,161.45
173	July 31, '16	10,360 "	Corte Madera	1.71	1.65		1.63•					10,670 "	1.39	14,831.30
174	July 11, '16	2,205 "	Antler	2.04	2.00•		2.03					2,180 "	1.36	2,964.80
175	July 31, '16	275 "	Camarillo							1.80•		275 "	1.29	354.75
D-93	Jan. 4, '16	9,320 "	El Cajon					$1.89•		1.91		9,595 "	1.36	13,049.20
M.R-484	1916	610 "	San Juan Cap.							1.69•		754 "	1.36	1,025.44
M.R-366	Mar. 10, '16	5,010 "	Brawley					1.97		1.89•		5,050 "	1.38	6,969.00
D-106	Sept. 18, '16	400 "	El Cajon					1.99		1.96•		300 "	1.43	429.00
D-111	Oct. 10, '16	270. "	Merced		1.60•							270 "	1.36	367.20
												110,090 "	Av. $1.371	$150,958.28

• Successful bidder
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For key to bidders see "Analysis of Cement Purchases in Year 1912".

State of California

California Highway Commission

ANALYSIS OF CEMENT PURCHASES IN YEAR 1917

Cont. No.	Date of Award	Quantity Bid On	Delivery Points	1	2	3	4	5	6	7	8	Quantities Delivered	Mill Base	Cost at Mill
P 178	Feb. 8,'17	1,080 Bbls.	Seeley				$2.29	$2.08		$2.05•		1,170 Bbls.	$1.33	$ 1,556.10
179	May 23,'17	7,050 "	Dougherty	$1.70•	$1.75		1.72					5,500 "	1.46	8,030.00
179					1.75•							1,800 "	1.51	2,718.00
P 180	May 23,'17	679 "	Yreka	2.30	2.30		2.29•					687.50"	1.43	983.13
P 181	May 23,'17	6,660 "	Castaic		2.20			1.92	$1.905	1.90	$1.885•	7,183 "	1.41	10,128.03
P 182	May 23,'17	1,275 "	Gaviota	2.03	2.05	$2.02•		2.14		2.07		2,098 "	1.50	3,147.00
183	May 23,'17	5,740 "	Cordelia	1.61	1.58•		1.61					2,058 "	1.49	3,066.42
184	June 4,'17	14,440 "	Los Alamos	2.09	2.10	2.08		2.11		2.05•		10,265 "	1.44	14,781.60
184			Wigmore					2.05•				920 "	1.44	1,324.80
P 185	June 7,'17	9,410 "	Pixley		1.96		1.92•	2.08	2.145	2.10	2.27	4,993 "	1.50	7,489.50
185			Pixley					1.92•				3,309 "	1.455	4,814.60
186	June 7,'17	13,440 "	Dixon	1.65	1.62•		1.65					8,215 "	1.48	12,158.20
187	June 7,'17	2,500 "	Castle Craig		2.12•		2.13					2,233 "	1.495	3,338.34
P 188	June 7,'17	6,712 "	Montalvo		2.05			2.02	2.00•		2.02	6,580 "	1.43	9,409.40
189	June 7,'17	15,060 "	Tulare	1.95•	1.95	1.97						9,696 "	1.56	15,125.76
189			Loma					1.95•				5,380 "	1.455	7,827.90
P 190	June 7,'17	10,500 "	Radnor		1.96		1.92•	2.08	2.145	2.10	2.27	5,620 "	1.50	8,430.00
190			Radnor					1.92•				4,957 "	1.455	7,212.44
191	July 7,'17	17,440 "	Hershey	1.78•	1.80		1.79					3,780 "	1.515	5,726.70
191			Dunnigan		1.78•							2,414 "	1.65	3,983.10
192	July 7,'17	6,000 "	Altamont	1.77	1.74		1.69•					4,875 "	1.425	6,946.88
193	July 7,'17	19,000 "	Creston	1.79	1.65		1.58•					5,168.50 "	1.505	7,778.59
194	July 7,'17	17,210 "	Camohora	2.09	2.03	1.88•						16,864 "	1.443	24,334.75
P 195	July 7,'17	10,130 "	Pixley	2.01	1.96•	1.98			2.135			5,965 "	1.49	8,887.85
195			Pixley					1.92•				4,535 "	1.455	6,598.42
196	July 7,'17	14,750 "	Tulare	2.00	1.95•	1.96			2.135			7,759 "	1.49	11,560.91
196			Tulare					1.95•				1,727.50 "	1.475	2,548.06
197	Aug.28,'17	15,100 "	Orella		2.02	2.02		1.81•	1.94	2.08	1.92	170 "	1.39	236.30
198	Aug.28,'17	12,600 "	Elwood		2.02	1.97		1.70•	1.39	1.95	1.79	7,299.50 "	1.28	9,343.36
199	Aug.29,'17	3,300 "	Delta		1.97•	2.06						1,662 "	1.42	2,359.04
200	Aug.29,'17	3,530 "	Cottonwood		1.87•	1.96						416 "	1.42	593.56
201	Aug.29,'17	10,930 "	Crockett	1.61•	1.65		1.62					2,975 "	1.48	4,403.00
201			Crockett		1.75•							626 "	1.655	1,036.03
202	Aug.29 '17	7,680 "	Castaic		2.20			1.62•		1.95	1.975	7,487 "	1.21	9,059.27
203	Sept.25,'17	800 "	Redding	1.93	1.90		1.86•					1,040 "	1.48	1,539.20
204	Sept.27,'17	230 "	Fl Cajon		2.30			1.81•	2.15	2.14	2.155	275 "	1.28	352.00
205	Sept.27,'17	590 "	Rhonerville		2.25•		2.28					541 "	1.50	811.50
206	Nov. 5,'17	21,000 "	Penn Grove	1.76	1.78		1.74•					3,874 "	1.50	5,811.00
207	Nov. 5,'17	12,500 "	Biggs	1.76	1.76•		1.78					1,485 "	1.55	2,301.75
208	Nov. 5,'17	26,400 "	San Rafael	1.76	1.75		1.74•					2,707 "	1.50	4,060.50
209	Nov.30,'17	500 "	Auburn	1.95	1.78•							546 "	1.515	827.19
210	Nov.30,'17	21,800 "	Nipomo	2.11						1.92•		810 "	1.37	1,109.70
211	Nov.30,'17	3,130 "	South Fork	2.66	2.56•							1,261 "	1.50	1,891.50
213	Nov.30,'17	15,200 "	La Crescenta					1.51•				4,325 "	1.19	5,146.75
											Forwarded	173,245 "		$250,788.13

State of California

California Highway Commission

ANALYSIS OF CEMENT PURCHASES IN YEAR 1917 (Cont.)

Cont. No.	Date of Award	Quantity Bid On	Delivery Points	BIDDERS 1	2	3	4	5	6	7	8	Quantities Delivered	Mill Base	Cost at Mill
										Brought Forward		173,245 Bbls.		$250,788.13
D-56	June 13,'17	160 Bbls.	Willits				$2.42•					160 •	$1.49	238.40
D-56	Aug.31,'17	1,100 •	Shelter Cove		$2.64•							1,100 •	1.55	1,705.00
D-88		1,024 •	Healdsburg		1.96		1.91•					1,090 •	1.50	1,635.00
D-108	Mar. 13,'17	800 •	Le Grand	1.69•								1,080 •	1.44	1,555.20
D-119	Mar. 20,'17	210 •	Niles				1.67•					210 •	1.44	302.40
D-120	July 11,'17	210 •	El Cajon					$2.00•				210 •	1.47	308.70
D-121	May 9,'17	160 •	San Luis Obispo			$1.89•						160 •	1.50	240.00
D-125	May 9,'17	5,520 •	Edenvale			1.74•						5,140 •	1.50	7,710.00
D-126	May 4,'17	300 •	Willotta		1.49•							500 •	1.40	700.00
D-128	May 22,'17	500 •	Laws					2.33•				500 •	1.455	727.50
D-136-9	Dec. 3,'17	2,300± •	Templeton	$2.11	2.06			1.92•		$2.19		1,780 •	1.36	2,420.80
D-147	July 18,'17	1,597 •	Davis	1.65	1.64•							1,855 •	1.50	2,782.50
D-148-9	Aug. 3,'17	5,700 •	Washington		1.69•							5,497 •	1.50	8,245.50
D-150	July 26,'17	22,300 •	Acton		2.04			1.89•	$1.955	$1.91	$2.045	17,418 •	1.48	25,778.64
D-153	Aug. 29,'17	11,520 •	Port Costa	1.56•	1.65		1.62					5,450 •	1.50	8,175.00
D-156		900 •	Milpitas		1.66•							819 •	1.47	1,203.93
D-157		920 •	Santa Clara	1.71	1.66•		1.69					1,186 •	1.47	1,743.42
D-159	Oct. 1,'17	265 •	San Bernardino					1.42•		1.65		265 •	1.345	356.42
D-104	July 11,'17		Valley Springs		1.76•		1.77					1,191 •	1.53	1,821.23
M.R-632			Saugus					1.68•				244 •	1.33	324.52
M.R-632			Claremont							2.20•		44 •	1.33	58.52
M.R-632			Capistrano					1.72•				200 •	1.33	266.00
M.R-632			Serra					1.69•				520 •	1.33	691.60
M.R-632			Mateo					1.69•				640 •	1.33	851.20
M.R-540	May 9,'17	290 •	San Jose			1.74•						290 •	1.50	435.00
												220,794 •	Av. $1.454	$321,064.61

• Successful Bidder
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State of California

California Highway Commission

ANALYSIS OF CEMENT PURCHASES IN YEAR 1918

Cont. No.	Date of Award	Quantity Bid On		Delivery Points	BIDDERS 1	2	3	4	5	6	7	8	Quantities Delivered		Mill Base	Cost at Mill
223	Apr.24	4,080	Bbls.	El Cajon					$2.24•				495	Bbls.	$1.63	$ 806.85
214	Jan. 9	2,210	•	Black Point	$1.75	$1.75•		$1.77					1,930	•	1.51	2,914.30
215	Jan. 9	700	•	Willits	2.43	2.43•		2.45					721	•	1.50	1,081.50
216	Jan. 9	18,200	•	King City		2.10	$1.95•						6,429	•	1.45	9,322.05
217	Jan.29	6,570	•	La Mesa					1.81		$1.61•.		4,865	•	1.04	5,059.60
218	Mar.14	10,500	•	Santa Cruz	2.09		1.76•						774	•	1.70	1,315.80
219	Mar.14	200	•	El Cajon					1.90	$2.00	1.71•	$1.90	000	•	1.18	0.00
220	Mar.22	515	•	Eureka	2.24•	2.27							000	•	1.67	0.00
221	Mar.22	3,340	•	Oceanside	2.65					2.22	2.23	2.18•	1,028	•	1.75	1,799.00
222	Apr.27	1,500	•	Riverbank	2.20	2.27		2.23•					1,045	•	2.00	2,090.00
But-3-B	Mar.28	21,000	•	Biggs		1.76•	1.85						000	•	1.55	0.00
Mon-2-G	Mar.28	14,000	•	San Lucas		2.17	1.97•						000	•	1.45	0.00
D-173	Jan.29	54,400	•	Castaic					1.61	1.825	1.505•	1.595	6,580	•	1.09	7,172.20
D-173	Mar.12	5,000	•	Single Springs	2.00•		2.09						6,335	•	1.77	11,212.95
M.R (769 (775	Mar.12	210	•	San Jose	1.91•		1.93						000	•	1.76	0.00
D-186	Apr.10	1,000	•	Upland					1.83•	1.895	2.45	2.03	1,000	•	1.63	1,630.00
M.R-782	Mar.26	1,400	•	Winevale	2.04	2.04•							000	•	1.70	0.00
D-185	Feb.25	320	•	Merced	1.91	1.90•		1.91					350	•	1.69	591.50
													31,552	•	Av. $1.426	$44,995.75

• Successful Bidder
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APPENDIX O.

VOTE ON STATE HIGHWAY BONDS.

Counties	1910—$18,000,000 issue		1916—$15,000,000 issue		Ratio, to 1
	For	Against	For	Against	
Alameda	10,199	5,328	63,268	11,561	5.47
Alpine	28	3	49	5	9.80
Amador	304	364	1,655	288	5.74
Butte	1,557	831	5,195	1,427	3.64
Calaveras	451	420	1,321	399	3.31
Colusa	408	398	1,516	458	3.31
Contra Costa	1,275	782	7,513	1,653	4.55
Del Norte	193	39	739	37	19.97
El Dorado	1,608	283	1,576	431	3.65
Fresno	2,092	2,843	12,325	5,958	2.06
Glenn	348	285	1,761	515	3.42
Humboldt	1,300	1,000	6,102	1,811	3.37
Imperial	326	365	4,549	378	12.03
Inyo	442	118	1,413	144	9.81
Kern	1,361	543	9,346	1,103	8.47
Kings	401	659	3,552	737	4.81
Lake	293	319	1,414	244	5.79
Lassen	229	160	1,251	260	4.81
Los Angeles	7,665	26,954	126,261	39,485	3.20
Madera	312	156	1,732	464	3.73
Marin	1,458	539	5,788	788	7.35
Mariposa	185	106	818	139	5.88
Mendocino	968	608	3,269	1,513	2.16
Merced	533	359	3,401	614	5.54
Modoc	274	122	1,045	333	3.13
Mono	84	29	160	37	4.56
Monterey	1,183	520	5,193	885	5.86
Napa	645	750	3,742	1,213	3.08
Nevada	905	436	3,328	299	11.14
Orange	555	2,107	9,382	3,575	2.62
Placer	1,180	406	2,892	816	3.54
Plumas	240	174	815	201	4.05
Riverside	635	1,896	7,230	2,386	3.03
Sacramento	5,284	1,385	14,565	2,298	6.34
San Benito	309	372	1,768	552	3.20
San Bernardino	1,463	2,451	10,840	4,490	2.41
San Diego	1,665	3,384	18,943	3,758	5.04
San Francisco	22,685	8,153	93,705	16,647	5.63
San Joaquin	2,028	2,469	10,662	4,024	2.64
San Luis Obispo	958	537	4,913	667	7.36
San Mateo	1,549	542	5,758	1,163	4.95
Santa Barbara	1,292	577	6,295	945	6.66
Santa Clara	3,467	2,106	18,164	5,544	3.27
Santa Cruz	1,084	935	6,028	1,159	5.20
Shasta	974	453	3,000	782	3.83
Sierra	289	74	507	90	5.63
Siskiyou	1,081	367	3,028	1,004	3.02
Solano	1,392	546	5,923	919	6.45
Sonoma	2,250	1,797	9,787	4,650	2.10
Stanislaus	1,147	599	5,210	1,679	3.10
Sutter	332	289	1,243	524	2.37
Tehama	491	477	2,607	655	3.98
Trinity	231	187	767	116	6.61
Tulare	1,112	1,282	7,674	3,125	2.46
Tuolumne	526	328	1,561	367	4.25
Ventura	498	723	4,278	623	6.87
Yolo	883	409	3,213	777	4.14
Yuba	667	165	2,090	392	5.33
Totals	93,297	80,509	542,239	137,107	3.96

Total vote—	
1910	173,806
Plurality for bonds	12,786
1916	679,346
Plurality for bonds	405,132

APPENDIX P.

Semiannual Statement of Apportionment of Receipts for the Period January 1, 1918, to June 30, 1918, inclusive, of the State Motor Vehicle Department.

	AUTOMOBILES	MOTORCYCLES	AUTO DEALERS	M/C DEALERS	TRAILERS	SUBSTITUTIONS	TOTALS	REFUNDS	NET RECEIPTS	EXPENSES	NET APPORTIONMENT	STATE & COUNTY APPORTIONMENT EACH 1/2
Alameda	207861.68	3268.80	2861.00	70.00	6.50	4967.40	219035.38	4119.50	214915.88	24250.68	190665.20	95332.60
Alpine	152.05	2.00					154.05		154.05	17.37	136.68	68.34
Amador	5573.10	13.00	125.00			97.20	5808.30	60.80	5747.50	648.52	5098.98	2549.49
Butte	28487.20	297.05	536.75	10.00	3.00	601.05	29935.05	474.10	29460.95	3324.30	26136.65	13068.32
Calaveras	4075.90	33.40	56.25			64.70	4230.25	25.60	4204.65	474.43	3730.22	1865.11
Colusa	14090.70	83.50	491.00	5.00		406.68	15076.88	362.10	14714.78	1660.38	13054.40	6527.20
Contra Costa	31506.05	603.50	580.75	15.00	2.00	631.03	33338.33	566.30	32772.03	3697.93	29074.10	14537.05
Del Norte	1734.30	2.00	25.00			6.95	1768.25	11.80	1756.45	198.19	1558.26	779.13
El Dorado	5039.55	36.50	81.00			115.92	5272.97	78.35	5194.62	586.14	4608.48	2304.24
Fresno	147495.10	1759.90	2868.75	31.90	1.50	4124.46	156281.61	2788.40	153493.21	17319.86	136173.35	68086.68
Glenn	14975.35	158.15	392.75		4.50	477.21	16007.96	197.05	15810.91	1784.07	14026.84	7013.42
Humboldt	24132.20	294.80	568.75	5.00		271.00	25271.75	362.15	24909.60	2810.74	22098.86	11049.43
Imperial	45149.48	133.50	1053.75	10.00	6.50	1246.83	47600.06	912.90	46687.16	5268.08	41419.08	20709.54
Inyo	6986.20	6.00	118.75			191.15	7302.10	81.20	7220.90	814.78	6406.12	3203.06
Kern	75893.85	818.15	1023.00	23.75	14.00	1656.05	79428.80	1558.55	77870.25	8786.72	69083.53	34541.76
Kings	27063.60	172.15	500.75	8.75		720.58	28465.83	401.55	28064.28	3166.70	24897.58	12448.79
Lake	4836.15	17.65	127.00	60.00		93.25	5134.05	42.10	5091.95	574.56	4517.39	2258.70
Lassen	5056.55	17.00	93.75			89.05	5256.35	51.20	5205.15	587.33	4617.82	2308.91
Los Angeles	910499.00	12332.63	13814.30	91.00	351.50	21855.41	958943.84	29958.96	928984.88	104824.80	824160.08	412080.04
Madera	11319.15	164.50	185.25	3.75		240.58	11913.23	142.95	11770.28	1328.12	10442.16	5221.08
Marin	15762.20	141.25	204.00	3.75	1.50	196.00	16308.60	196.70	16111.90	1818.02	14293.88	7146.94
Mariposa	1777.60	7.00				22.55	1807.15	19.10	1788.05	201.75	1586.30	793.15
Mendocino	13584.25	44.75	316.50			183.78	14129.28	244.10	13885.18	1566.76	12318.42	6159.21
Merced	22127.25	215.65	506.25	10.00	8.50	510.51	23378.16	254.25	23123.91	2609.25	20514.66	10257.33
Modoc	5212.05	5.00	125.00			38.35	5380.40	59.00	5321.40	600.45	4720.95	2360.47
Mono	469.30					9.20	478.50	4.40	474.10	53.50	420.60	210.30
Monterey	25987.00	199.85	607.75	3.75		559.73	27358.08	355.75	27002.33	3046.87	23955.46	11977.73
Napa	16135.20	211.90	301.75	10.00		267.85	16926.70	306.05	16620.65	1875.44	14745.21	7372.61
Nevada	5948.25	23.15	145.75	3.75		58.10	6179.00	99.05	6079.95	686.05	5393.90	2696.95
Orange	78264.00	1386.95	1074.25	43.75	32.50	1857.75	82659.20	1667.90	80991.30	9138.90	71852.40	35926.20
Placer	14181.75	111.15	416.25	8.00	2.00	261.95	14980.10	228.40	14751.70	1664.55	13087.15	6543.57
Plumas	3059.85	1.50	81.25			53.15	3195.75	30.00	3165.75	357.21	2808.54	1404.27
Riverside	48050.95	885.20	909.75	33.75	11.00	1008.80	50899.45	915.20	49984.25	5640.12	44344.13	22172.07
Sacramento	84051.58	1142.78	1755.75	17.50	10.50	2542.73	89520.84	2074.45	87446.39	9867.27	77579.12	38789.56
San Benito	9305.10	95.15	181.00	5.00		226.85	9813.10	76.27	9736.83	1098.68	8638.15	4319.07
San Bernardino	69127.32	1413.70	1439.53	38.75	12.50	1612.76	73644.56	1195.60	72448.96	8175.00	64273.96	32136.98
San Diego	103280.10	1337.03	2145.25	37.50		2516.45	109316.33	2619.58	106696.75	12039.45	94657.30	47328.65
San Francisco	330210.92	2879.10	6001.00	47.00	46.00	8501.23	347685.25	8191.50	339493.75	38307.79	301185.96	150592.98
San Joaquin	83415.35	983.00	1664.75	20.00	23.00	2034.49	88140.59	1591.38	86549.21	9766.03	76783.18	38391.59
San Luis Obispo	23119.35	127.80	568.75			405.05	24220.95	267.15	23953.80	2702.89	21250.91	10625.46
San Mateo	29373.95	539.88	206.25	10.00	6.00	538.34	30674.42	442.10	30232.32	3411.35	26820.97	13410.48
Santa Barbara	51605.20	523.30	1205.00	28.75	1.50	1448.45	54812.20	981.00	53831.20	6074.20	47757.00	23878.50
Santa Clara	99820.05	1924.19	1738.75	33.75	35.50	1923.73	105475.97	1630.90	103845.07	11717.67	92127.40	46063.70
Santa Cruz	22819.60	266.25	800.25	5.00		411.48	24302.58	392.10	23910.48	2698.02	21212.46	10606.23
Shasta	11061.35	67.15	343.50	5.00		288.85	11765.85	154.75	11611.10	1310.17	10300.93	5150.47
Sierra	1455.30	2.00	35.00			29.80	1522.10	8.40	1513.70	170.80	1342.90	671.45
Siskiyou	11830.70	36.50	216.50			124.78	12208.48	127.30	12081.18	1363.21	10717.97	5358.98
Solano	24834.09	341.60	553.75	11.25		405.38	26146.07	453.54	25692.53	2899.09	22793.44	11396.72
Sonoma	47044.55	478.85	1040.75	23.75		747.24	49335.14	765.55	48569.59	5480.49	43089.10	21544.55
Stanislaus	59954.45	635.15	1255.00	27.50	10.00	1549.97	63432.07	1049.50	62382.57	7039.12	55343.45	27671.73
Sutter	11173.13	85.65		5.00		256.37	11520.15	117.50	11402.65	1286.65	10116.00	5058.00
Tehama	11890.85	125.25	407.00	8.75	3.00	281.73	12716.58	144.70	12571.88	1418.58	11153.30	5576.65
Trinity	721.85		31.25			5.25	758.35	7.80	750.55	84.69	665.86	332.93
Tulare	71410.20	584.70	1163.75	8.75	6.50	1729.30	74903.20	1142.43	73760.77	8323.01	65437.76	32718.88
Tuolumne	6201.45	23.00	93.75			120.95	6439.15	90.30	6348.85	716.39	5632.46	2816.23
Ventura	30786.66	203.95	681.25	5.00	4.00	1152.81	32805.66	370.80	32434.86	3659.88	28774.98	14387.49
Yolo	24463.10	206.90	376.50	5.00	12.00	733.68	25797.18	402.03	25395.15	2865.53	22529.62	11264.81

APPENDIX Q.

SHOWING STATE HIGHWAY CONTRACTS ARRANGED BY COUNTIES AND ROUTES WITH LENGTHS, TERMINI AND OTHER STATISTICS.

COMPLETED CONTRACTS.

Con. No.	L.O. No.	Div.	County	Rte.	Sec.	From	To	Length (Miles)	Contract Date	Contractor	Resident Engineer	Type of Work	Final Estimate			Engineering during Construction	Total
													Work	Materials	Total		
90	113	IV	Alameda	5	A	Greenville	Livermore	4.97	8-11-14	Parrott Bros. Co.	J. G Greene	15 ft. Concrete Base	27,449	21,699	49,148	3,231	52,379
108	136	•	•	5	•	Easterly Boundary	Altamont	6.00	10-6-14	Palmer & McBryde	R. Heany	15 ft. Concrete Base	53,751	24,422	78,173	4,511	82,684
D-54	153&136	•	•	5	•	Greenville	Easterly Boundary	10.84	8-4-15	Day Labor		Oil Surfacing	4,545	3,719	8,264	35	8,299
143	185	•	•	5	B	Livermore	Santa Rita	5.82	7-20-15	H. G. Vaughn Const. Co.	J. G. Greene	18 ft. Concrete Base	39,428	24,200	63,628	4,445	66,073
179	270	•	•	5	•	Santa Rita	Dublin	3.24	5-22-17	Bates, Borland & Ayer	H. C. Boyd	18 ft. Concrete Base	25,278	19,445	44,723	6,236	50,959
61	80	•	•	5	C	Hayward	Valle Vista School	3.12	4-22-14	Tieslau Bros.	A. P. Bosworth	18 ft. Concrete Base	21,794	18,868	40,662	2,613	43,275
D-7	80&152	•	•	5	•	Valle Vista School	Niles	6.21	11-19-14	Day Labor	C C Cottrell	18 ft. Concrete Base	52,584	31,679	84,263	2,088	86,351
D-44	80	•	•	5	•	Hayward	Niles	8.96	5-14-15	Day Labor		Oil Surfacing	3,333	3,803	7,136	47	7,183
62	81	•	•	5	D	Hayward	Oakland	5.06	4-22-14	Ransome-Crummey Co.	Leon L. Clarke	24 ft. Topeka on Macadam	61,309	4,122	65,431	3,211	68,642
122	154	III	Butte	3	C	Nelson	Chico	12.77	2-9-15	Whitlock & Gorrill	M. T. Heaton	15 ft. Concrete Base	73,669	63,232	136,901	6,462	143,363
D-92	211	•	•	3	•	4th St. Chapmantown	Little Chico Creek	4.40	12-18-15	Day Labor	J. H. Harvell	15 ft. Concrete Base	1,763	1,295	3,658	514	4,172
70	148&20	•	•	3	D	Lindo Channel	Northerly Boundary	12.70	6-9-14	P. L. Burr	J. H. Harvell	15 ft. Concrete Base	20,123	58,396	78,519	7,856	86,375
D-87	208&148	•	•	3	•	Chico	Northerly Boundary	12.66	12-4-15	Day Labor		Oil Surfacing	22		22	7	29
D-104	231	III	Calaveras	24	B	Valley Springs	San Andreas	10.00	5-11-16	Day Labor	F. J. Hunter	Grading	32,526	5,749	38,275	970	39,245
80	93	III	Colusa	7	A	Hershey	Berlin	10.97	6-23-14	C. L. Schaad	C. F. Heinze	15 ft. Concrete Base	62,629	50,866	113,495	6,963	120,458
151	93	•	•	7	•	Through Arbuckle		.31	8-10-15	Clark & Henery Const. Co.	E. D. Robinson	Topeka Surfacing	5,687		5,687	216	5,903
D-69	93	•	•	7	•	Hershey	Berlin	10.51		Day Labor	J. T. Haviland	Oil Surfacing	1,352	1,245	2,597	168	2,765
99	121	•	•	7	B	Berlin	Colusa Junction	12.67	9-10-14	C. L. Schaad	H. F. Holley	15 ft. Concrete Base	80,686	57,855	138,541	7,926	146,467
139	172	•	•	7	C	Colusa Junction	Northerly Boundary	10.67	6-22-15	L. F. Gerditz	R. R. Hatchett	15 ft. Concrete Base	48,915	48,432	97,347	4,110	101,457
117	141	•	•	15	A	Williams	Colusa	6.44	12-22-14	C. W. Cross	R. R. Hatchett	15 ft. Concrete Base	57,512	46,694	104,206	5,579	109,785
D-82	215	IV	Contra Costa	14	A	300' from Alameda Co. Line			11-11-15		Wm. H. Jaenicke	Culverts	1,140	514	1,654	147	1,801
D-84	115&158	•	• •	14	A	Richmond	Pinole	5.37	11-15-15	Day Labor	O. F. Georges	Oil Surfacing	2,929	1,525	4,454	111	4,565
D-86	158	•	• •	14	A	At San Pablo & Wild Cat Creeks			12-6-15	Day Labor	Wm. H. Jaenicke	Wing Walls on Bridges	260	61	321	213	534
91	114	•	• •	14	A	San Pablo Creek	Pinole	3.59	8-11-14	J. H. Falconer	G. L. Long	Grading	20,232	3,611	23,843	2,776	26,619
130	128&114	•	• •	14	A	Richmond	Pinole	5.37	4-30-15	Bates, Borland & Ayer	Wm. H. Jaenicke	15 and 18 ft. Concrete Base	29,143	19,331	48,474	4,358	52,832
170	153&222	•	• •	14	A	Southerly Boundary	Richmond	2.54	7-10-16	Blanchard, Brown & Co.	Hal J. Sums	20 ft. Topeka on Concrete	33,256	17,029	50,285	4,215	54,500
103	133	•	• •	14	B	Eckley	Martinez	6.49	9-22-14	Bates, Borland & Ayer	L. C. Winkleman	Grading	54,720	5,262	59,982	7,695	67,677
141	180	•	• •	14	B	El Ciervo (Tormey)	Eckley	5.46	7-7-15	Bates, Borland & Ayer	G. W. Wade	Grading	40,294	3,726	40,020	3,706	47,726
D-2	42	III	El Dorado	11	B	Shingle Springs	El Dorado	5.27		Day Labor	J. T. Haviland	12 ft. Oil Macadam	87,030	10,362	97,392	4,628	102,020
D-5	66	•	• •	11	C	El Dorado	Placerville	6.57		Day Labor	J. T. Haviland	12 ft. Concrete, Oil Surfacing	131,519	28,856	160,375	4,827	165,202
48	61	VI	Fresno	4	A	Fowler	Kingsburg	8.21	11-21-13	A. Teichert & Son	D. W. Chamberlin	15 ft. Concrete, Oil Surfacing	44,718	27,316	72,034	4,625	76,659
47	60	•	•	4	B	Fowler	Fresno	7.97	11-21-13	A. Teichert & Son	D. W. Chamberlin	20 ft. Concrete, Oil Surfacing	43,935	37,353	81,288	3,193	84,481
212	60	•	•	4	B	Malaga	Fresno	2.69	11-19-17	Blanchard, Brown & Co.	C. L. Foulke	Topeka Surfacing	14,033		14,033	165	14,198
8	9	•	•	4	C	Fresno	Herndon	9.56	8-27-12	Worswick Street Paving Co.	D. W. Chamberlin	15 ft. Concrete, Oil Surfacing	46,097	20,536	66,633	3,100	69,733
113	131	III	Glenn	7	A	South Boundary	Willows	8.59	11-20-14	C. W. Cross	R. R. Hatchett	15 ft. Concrete Base	39,243	35,174	74,417	5,871	80,288
140	177	•	•	7	B	Willows	Grapit	9.43	7-7-15	Taylor & Berliner	H. Carter	15 ft. Concrete Base	36,554	43,290	79,844	4,504	84,348
172	242	•	•	7	B	Walker Cr		1.04	7-10-16	M. Jacinto & A. L. Da Roza	R. R. Hatchett	15 ft. Concrete Base, & Bridge	8,551	5,315	13,866	960	14,826
77	87	•	•	7	C	Grapit	Northerly Boundary	6.96	6-9-14	P. H. Hoare	M. L. Heaton	15 ft. Concrete Base	40,374	17,789	58,163	2,755	60,918
D-70	87	•	•	7	C	Grapit	Northerly Boundary	6.94		Day Labor	J. T. Haviland	Oil Surfacing	3,087	1,306	4,393	243	4,636
44	54	I	Humboldt	1	A	Garberville	S.E. ¼ Sec. 1, T.5 S, R.3 E.	5.48	10-29-13	Fairbanks & Baechtel	L. O. Kennedy	Grading	49,075	3,578	52,653	2,462	55,115
60	78	•	•	1	A	Sec. 1, T.5 S, R.3 E	Southerly Boundary	4.58	4-22-14	Berry-Mackie & Co.	L. O. Kennedy	Grading	60,619	4,106	64,725	1,984	66,709
93	118	•	•	1	C	Miranda	Dyerville	13.75	8-11-14	Fairbanks & Baechtel	E. M. Cameron	Grading	151,011	10,051	161,062	7,034	168,096
71	91	•	•	1	D	Dyerville	Shively	7.23	6-9-14	Frank Smith & G. W. Connors	F. F. Hackney	Grading	97,247	5,422	102,669	5,622	108,291
104	110	•	•	1	D	Shively	Jordan Creek	3.70	10-6-14	Wm. Crowley & T. P. Cloney	J. H. Pratt	Grading	37,570	1,353	38,923	2,225	41,148
136	173	•	•	1	E	Jordan Creek	Rio Dell	6.86	6-2-15	Bates, Borland & Ayer	J. H. Pratt	Grading	63,240	5,014	68,254	3,556	71,810
166	230	•	•	1	E	Eel River Bridge (near Scotia)		.19	4-25-16	Mercer-Fraser Co.	J. F. Johnson	Steel Bridge	107,321	13,852	121,173	1,214	122,387
D-27	297	•	•	1	F	2½ miles No. of Rio Dell	¼ mile south of Alton	.82	12-31-13	Day Labor	G. L. Lang	Grading	11,113	232	11,345	864	12,209
105	135	•	•	1	G	Loleta	Beatrice	4.30	10-6-14	Elsemore & Jacobs	R. H. Wilson	Grading	21,774	2,533	24,307	2,160	26,467
169	135	•	•	1	G	Loleta	Beatrice	4.30	7-10-16	Elsemore & Jacobs	T. H. Densmore	15 ft. Concrete Base	22,076	14,056	36,132	5,420	41,552
107	117	VII	Imperial	12	A	Myers Creek	Coyote Wells	6.02	10-6-14	J. W. Calback	C. H. Wondries	15 ft. Concrete Base	82,590	23,363	105,953	6,665	112,618
159	308	•	•	12	A	Myers Creek Bridge		.06	11-23-15	Holland Const. Co.	J. H. Harvell	Concrete Bridge	25,382	8,188	33,570	2,529	36,099
D-100	117	•	•	12	A	San Diego & Arizona R.R. Crossing				Day Labor	C. H. Wondries	Abutments for Subway	5,752	2,978	8,730	35	8,765
D-107	117	•	•	12	A	Myers Creek	Coyote Wells			Day Labor	C. H. Wondries	Constructing Detours	1,597	473	2,070	32	2,102
116	142	•	•	12	B	Coyote Wells	Dixieland	11.74	12-8-14	Rice & Dutcher	A. W. Allen	15 ft. Concrete Base	76,639	34,897	111,536	5,481	117,017
161	214	•	•	12	C	Dixieland	El Centro	11.87	12-12-15	Fred Hoffman	A. W. Allen	15 ft. Concrete Base	72,065	32,940	105,005	4,711	109,716
178		•	•	12	C	New River Bridge		.06	2-6-17	Mercereau Br. & Const. Co.	R. N. Ransom	Concrete Bridge	12,349	7,189	19,538	1,621	21,159

COMPLETED CONTRACTS—Continued.

Con. No.	L.C. No.	Div.	County	Rte.	Sec.	From	To	Length (Miles)	Contract Date	Contractor	Resident Engineer	Type of Work	Final Estimate			Engineering during Construction	Total
													Work	Materials	Total		
106	126	VI	Kern	4	A	Southerly Boundary	2.3 Miles So.Rose Station	10.37	10-6-14	A. C. McLean Const. Co.	C. C. Boyer	Grading	86,424	6,177	92,601	9,258	101,859
D-75	126	•	•	4	A	Southerly Boundary	2.3 Miles So.Rose Station	8.66	9-24-15	Day Labor	F. H. McGill	Oiling Graded Road	3,617		3,617	289	3,906
95	106	•	•	4	B	Grapevine Creek	Sec.5 & 6,T.32 S,R.29 E.	17.29	8-28-14	Lynn S. Atkinson	F. H. McGill	15 ft. Concrete Base	220,863	52,794	273,657	9,707	283,364
D-96	106	•	•	4	B	Grapevine Creek	Sec.5 & 6,T.32 S,R.28 E.	17.29	1-7-16	Day Labor		Oil Surfacing	514	7,504	8,018		8,018
67	97	•	•	4	C	Sec.5 & 6,T.32 S,R. 28 E.	Bakersfield	12.98	5-27-14	John D. Marsh	J. C. North	15 ft. Concrete Base	84,338	57,193	141,531	6,998	148,529
D-51	97	•	•	4	C	Sec.5 & 6,T.32 S,R. 28 E.	Bakersfield	12.98		Day Labor	B. J. Pardee	Oil Surfacing	4,799	3,524	8,323	276	8,599
[illegible]	69	•	•	4	D	Bakersfield	Lerdo	10.12	2-26-14	Geo.S.Benson & Sons	C. V. James	15 ft. Concrete Base	36,061	40,759	76,820	4,575	81,395
D-30	69	•	•	4	D	Beardsley Canal		.01		Day Labor	F. H. McGill	15 ft. Concrete Base	3,690	1,868	5,558	418	5,976
D-32	69	•	•	4	D	Bakersfield	Lerdo	10.14		Day Labor	F. H. McGill	Oil Surfacing	4,209	2,437	6,646	260	6,906
51	70	•	•	4	E	Lerdo	Famosa	9.06	2-26-14	Geo.S.Benson & Sons	C. V. James	15 ft. Concrete Base	27,429	36,169	63,598	4,059	67,657
D-41	70	•	•	4	E	Lerdo	Famosa	9.09		Day Labor	B. J. Pardee	Oil Surfacing	3,383	1,874	5,257	217	5,474
63	82	•	•	4	F	Northerly Boundary	Dearborn	12.45	4-22-14	Lynn S. Atkinson	A. F. Carlinghouse	15 ft. Concrete Base	51,320	50,789	102,109	3,702	105,811
D-35	82	•	•	4	F	Northerly Boundary	Dearborn	12.44		Day Labor	B. J. Pardee	Oil Surfacing	4,498	2,667	7,165	313	7,478
138	171	VI	Kings	10	A	Hanford	Easterly Boundary	8.96	6-22-15	Geo.S.Benson & Sons	G. R. Brown	15 ft. Concrete Base	57,468	37,563	95,031	3,515	98,546
17	17	VII	Los Angeles	2	A	County Highway No. 3	Rancho El Encino	6.55	10-22-12	Rogers Bros. Co.	Chas. G. Kolster	15 ft. Concrete,Oil Surfacing	36,538	14,639	51,177	3,494	54,671
21	29	•	• •	2	B	Rancho El Encino	Calabasas	10.27	5-4-13	John D. Marsh	C. F. Spellmeyer	15 ft. Concrete,Oil Surfacing	69,508	28,852	98,360	7,727	106,087
33	38	•	• •	2	C	Calabasas	Westerly Boundary	11.28	5-21-13	Gillette,Montgomery&Tracy	Chas. G. Kolster	15 ft. Concrete Base	108,988	28,825	137,813	8,609	146,422
D-14	38	•	• •	2	C	Calabasas	Westerly Boundary	11.28		Day Labor	H. R. Postle	Oil Surfacing	17,477	2,047	19,524	638	20,162
134	168	•	• •	4	A	Saugus	Castaic	4.21	5-1-15	H.R.Kennedy & F.Williams	J. C. More	15 ft. Concrete Base	20,961	10,537	31,498	3,225	34,723
191	272	•	• •	4	A	Castaic	Castaic School	4.08	5-22-17	Brashear, Burns Co.	L. W. Cummings	15 ft. Concrete Base	24,889	16,018	40,907	3,125	44,032
D-91	168	•	• •	4	A	Santa Clara River				Day Labor	John C. More	Bank Protection	3,133		3,133	242	3,375
131	129	•	• •	4	B	Castaic School	Sec.17, T.6 N.,R.17 W.	12.84	9-22-14	Mahoney Bros.	H. J. Sheafe	Grading	127,217	7,598	134,815	12,735	147,550
202	129	•	• •	4	B	Castaic School	Kay Ranch	3.79	8-28-17	Brashear, Burns Co.	J. C. Beckjord	20 ft. Concrete Base	40,936	10,449	51,385	4,268	55,653
D-73	129	•	• •	4	B	Castaic School	Sec.17, T.6 N.,R.17 W.	12.84	6-24-15	Day Labor	E. S. Gripper	Oiling Graded Road	53,745	5,853	59,598	1,894	61,492
D-64	151	•	• •	4	C	Sec.17, T.6 N.,R.17 W.	Liebre Mountain	14.52	8-24-15	Day Labor	E. S. Gripper	Oiling Graded Road					
120	151	•	• •	4	C	Sec.17, T.6 N.,R.17 W.	Liebre Mountain	14.52	12-22-14	Lee Moor Cont. Co.	E. S. Gripper	Grading	301,338	14,466	315,804	13,871	329,675
78	98	•	• •	4	D	Liebre Mountain	Northerly Boundary	12.62	6-9-14	Lee Moor Cont. Co.	Chas. C. Kolster	15 ft. Concrete Base	147,596	32,622	180,218	14,643	194,861
D-90	98	•	• •	4	D	Liebre Mountain	Northerly Boundary	8.34		Day Labor	L. W. Cummings	Oil Surfacing	4,603	1,062	5,665	358	6,023
147	184	•	• •	9	A	Rancho Tujunga	La Canada	4.90	7-23-15	Andrew Holloway	H. J. Sheafe	15 ft. Concrete Base	37,959	14,038	51,997	4,756	56,753
D-39	[illegible]	•	• •	9	C-D	County Highway Div. 34	Easterly Boundary	.60	4-6-15	Day Labor	C. H. Wondries	15 ft. Concrete,Oil Surfacing	7,183	2,845	10,028	650	10,678
9	10	VI	Madera	4	A	Southerly Boundary	Madera	10.00	8-27-12	Worswick St. Paving Co.	D. W. Chamberlin	15 ft. Concrete,Oil Surfacing	49,367	24,298	73,665	4,234	77,899
3	3	•	•	4	B	Madera	Califa	9.99	7-23-12	Ransome-Crummey Co.	C. V. James	15 ft. Oil Macadam	68,683	244	68,927	4,905	73,832
10	11	•	•	4	C	Califa	Northerly Boundary	6.92	8-27-12	Worswick St. Paving Co.	F. H. McGill	15 ft. Concrete,Oil Surfacing	34,739	15,097	49,836	4,663	54,499
150	188	IV	Marin	1	A	Northerly Boundary	Gallinas Creek	4.00	8-10-15	R. B. Markle, Jr.	L. C. Winkelman,Jr.	Grading	22,911	2,941	25,852	3,802	29,654
D-95	188	•	•	1	A	Northerly Boundary	Gallinas Creek	1.04	12-2-15	Day Labor	C. C. Cottrell	Gravel Surfacing	2,730	733	3,463	43	3,506
65	95	•	•	1	B	Larkspur	Sausalito	6.00	5-27-14	O'Brien Bros.	Clay Anderson	Grading	60,401	10,170	70,571	5,147	75,718
173	95	•	•	1	B	Larkspur	Sausalito	5.06	7-10-16	Marin Rock Co.	I. N. Atkinson	18 ft. Concrete Base	27,978	27,810	55,788	5,149	60,937
D-36	161	•	•	1	E	Ross	Larkspur	.59	4-5-15	Day Labor	C. C. Cottrell	18 ft. Concrete Base	12,472	5,162	17,634	586	18,220
D-37	162	•	•	1	B	At Coyote Creek		.06	4-6-15	Day Labor	F. Blockley	Grading	992	65	1,057	305	1,362
163	188	•	•	8	A	Petaluma Creek Bridge		.27	1-11-16	Healy-Tibbitts Const. Co.	B. C. Gerwick	Bascule Bridge	93,912	7,665	101,577	6,965	108,543
214	254	•	•	8	A	Novato Creek and Simonds Slough Bridges		.14	12-19-17	Duncanson,Harrelson Co.	R. E. Messner	Concrete Bridges	28,328	7,901	36,229	702	36,931
157	206	VI	Mariposa	18	A	Westerly Boundary	Cathay White Rock Road	10.05	11-9-15	Geo. R. Daley	R. S. Badger	Grading	66,372	5,970	72,342	5,880	78,222
2	2	I	Mendocino	1	A	Southerly Boundary	Hopland	12.60	7-25-12	General Const. Corp.	F. A. Kittredge	Grading	92,300	980	93,280	2,675	95,955
87	129	•	•	1	B	Hopland	Ukiah	11.40	8-11-14	Hard Bros.	J. D. Archer	15 ft. Concrete Base	78,690	15,533	94,223	8,164	102,387
D-113	[illegible]	•	•	1	B	4 miles south of Ukiah	Ukiah	4.06		Day Labor	J. D. Archer	Oil Surfacing	1,999	1,700	3,699	30	3,729
24	28	•	•	1	C	Ukiah	Forsythe Creek	7.73	5-26-13	D.L.Sawyer & Chas.Whited	J. D. Archer	Water Bound Macadam	74,219	4,529	78,748	5,419	84,167
57	55	•	•	1	D	Forsythe Creek	Ridgewood	6.55	4-22-14	Hard Bros.	Wynn Meredith	Grading	55,912	3,992	59,904	5,027	64,931
D-4	55	•	•	1	D	Forsythe Creek	Ridgewood	1.24		Day Labor	L. O. Kennedy	Grading	15,537	1,109	16,646	1,029	17,675
20	27	•	•	1	E	Ridgewood	Willits	6.84	2-4-13	Fairbanks & Baechtel	L. O. Kennedy	Grading	38,266	872	39,138	3,415	42,553
D-56	200 201 202	•	•	1	IJK	Rattlesnake Summit	Northerly Boundary	33.11	8-1-15	Day Labor	J. J. Stockard	Grading	489,899	42,931	532,830	17,531	550,361
69	18	VI	Merced	4	A	Merced	Southerly Boundary	14.27	5-27-14	Taylor & Berliner	R. S. Badger	15 ft. Concrete Base	59,304	61,855	121,159	6,945	128,104
D-12	18	•	•	4	A	Merced	Southerly Boundary	14.35		Day Labor	E. J. Pardee	Oil Surfacing	5,988	3,143	9,131	393	9,524
11	12	•	•	4	C	Arena	Merced	10.86	9-25-12	Worswick St. Paving Co.	R. S. Badger	15 ft. Concrete,Oil Surfacing	61,581	34,435	96,016	6,925	102,942
6	6	•	•	4	D	Northerly Boundary	Arena	9.74	8-27-12	Worswick St. Paving Co.	R. S. Badger	15 ft. Concrete,Oil Surfacing	53,317	22,166	75,484	4,244	79,728
D-79	203	VI	Mono	23	A	Southerly Boundary	Sherwin Hill	5.80	10-4-15	Day Labor	C. C. Boyer	Grading	38,621	3,317	41,938	2,990	44,928
D-101		•	•	23	B	Sherwin Hill	Whiskey Canyon	4.80	4-4-16	Day Labor	C. C. Boyer	Grading	18,651	13	18,664	318	18,982
41	52	V	Monterey	2	A	Salinas	Easterly Boundary	4.34	10-29-13	E. O. Burge	J. C. Alstrom	Grading	34,439	2,307	36,746	3,655	40,401
131	52	•	•	2	A	Salinas	Lagunita	4.93	4-30-15	Burns, Jacinto & De Roza	H. S. Tolen	15 ft. Concrete Base	31,233	16,037	47,270	1,870	49,140
D-61	52	•	•	2	A	Lagunita	Easterly Boundary	4.34		Day Labor	H. S. Tolen	15 ft. Concrete Base	41,523	9,669	51,192	3,008	54,200
137	174	•	•	2	B	Chualar	Salinas	10.29	6-2-15	W. A. Dontanville	C. F. Price	15 ft. Concrete Base	14,032	38,230	52,262	2,964	55,226
194	285	•	•	2	C	Camphora	Chualar	10.95	7-2-17	Palmer & McBryde	K. Beck	15 ft. Concrete Base	51,815	50,461	102,276	3,545	105,821
152	191	•	•	2	D	Greenfield	Camphora	11.24	8-10-15	Highway Paving & Const.Co.	O. C. Tretten	15 ft. Concrete Base	67,536	39,537	107,073	5,552	112,625
133	25	•	•	2	E	3.2 miles N. of King City	Greenfield	7.35	5-8-15	Highway Paving & Const.Co.	E. Evers	15 ft. Concrete Base	53,905	19,963	73,868	3,256	77,124
132	160	•	•	2	H	3 miles N. of Bradley	San Ardo	10.88	4-30-15	Frank L. Smith Co.	W. C. Little, Jr.	15 ft. Concrete Base	97,511	29,567	127,078	6,378	133,456

COMPLETED CONTRACTS—Continued.

Con No.	L.O. No.	Div.	County	Rte.	Sec.	From	To	Length (Miles)	Contract Date	Contractor	Resident Engineer	Type of Work	Final Estimate			Engineering during Construction	Total
													Work	Materials	Total		
D-15	[illegible]	IV	Napa	8	A	Carneros Creek	Napa	4.25	9-28-14	Day Labor	I. M. Atkinson	15 ft. Concrete, Oil Surfacing	58,448	16,936	75,384	3,704	79,088
D-19	143	VII	Orange	2	A	Easterly Boundary	Sec.32, T.8 S., R.7 W.	3.56	10-24-14	Day Labor	J. G. Beckjord	15 ft. Concrete Base	24,444	13,761	38,205	1,618	39,823
D-45	[illegible]	•	•	2	A	Galivan	Southerly Boundary	15.08	6-2-15	Day Labor		Constructing Detours	2,466		2,466	220	2,686
D-76	[illegible]	•	•	2	A	Southerly Boundary	San Juan Creek	8.82		Day Labor	C. N. Ainley	Oil Surfacing	8,308	5,376	13,684	505	14,189
119	149	•	•	2	A	San Juan Capistrano	Galivan	5.57	12-22-14	M. R. Co. Inc.	J. G. Beckjord	15 ft. Concrete Base	38,629	12,902	51,531	2,613	54,144
D-25	165	•	•	2	A	Serra	San Juan Creek	2.19	1-5-15	Day Labor	J. G. Beckjord	15 ft. Concrete Base	15,418	10,139	25,557	1,730	27,287
123	155	•	•	2	A	Sec.32, T.8 S., R.7 W.	Serra	3.80	4-6-15	Brashear, Burns Co.	C. V. James	Grading	33,488	4,451	37,939	3,440	41,379
D-66	155	•	•	2	A	Sec.32, T.8 S., R.7 W.	Serra	3.07	6-24-15	Day Labor	J. G. Beckjord	15 ft. Concrete Base	12,309	9,718	22,027	468	22,495
97	116	•	•	2	B	Galivan	Irvine	9.37	6-26-14	B.R.Davisson Const. Co.	C. F. Spellmeyer	15 ft. Concrete Base	69,789	26,217	96,006	5,128	101,134
D-77	116	•	•	2	B	Galivan	Irvine	9.37		Day Labor	J. H. Kreitler	Oil Surfacing	2,079	2,426	4,505	683	5,188
98	120	•	•	2	C	Irvine	Santa Ana	7.40	9-10-14	White & Gaskill	John C. More	15 ft. Concrete Base	37,866	16,975	54,341	3,651	58,492
D-59	120	•	•	2	C	Irvine	Santa Ana	7.40		Day Labor	J. H. Kreitler	Oil Surfacing	2,772	3,089	5,861	833	6,694
40	[illegible]	•	•	2	D.E.F	Santa Ana	Northerly Boundary	11.16	10-29-13	Conner Contracting Co.	Geo. R. Brown	18 ft. Concrete Base	61,994	32,630	94,624	5,672	100,296
D-12	48	•	•	2	D	Santa Ana	Anaheim	4.94		Day Labor	Geo. R. Brown	Topeka Surfacing	4,581	12,235	16,816	364	17,180
D-20	49	•	•	2	E	Anaheim	Fullerton	1.51		Day Labor	Geo. R. Brown	Topeka Surfacing	2,289	4,194	6,483	359	6,842
D-23	50	•	•	2	F	Fullerton	Northerly Boundary	4.75		Day Labor	Geo. R Brown	Oil Surfacing	3,319	2,318	5,637	883	6,520
13	15	III	Placer	3	A	Southerly Boundary	Lincoln	9.90	9-25-12	Burns, Clark & Da Roza	J. L. Piper	15 ft. Concrete, Oil Surfacing	68,795	25,386	94,181	8,185	102,366
165	229	•	•	3	A	Andora Under-pass		0.12	4-18-16	Ross Const. Co.	C. M. Butts	Subway	5,688	2,598	8,286	910	9,196
136	225	•	•	3	B	Lincoln	Northerly Boundary	8.57	11-9-15	C. H. & A. W. Gorrill	J. L. Piper	15 ft. Concrete Base	46,443	33,963	82,406	5,712	88,118
168	230	•	•	17	A	Roseville	Penryn	7.52	7-10-16	A.C. McLean Const. Co.	R. R. Hatchett	15 ft. Concrete Base	38,140	25,824	63,964	4,040	68,004
164	216	•	•	17	B	Penryn	Auburn	6.48	1-11-16	A.C. McLean Const. Co.	S. J. Treadaway	15 ft. Concrete Base	39,387	28,277	67,664	4,615	72,279
43	53	VII	Riverside	19	A	Westerly Boundary	Riverside	9.32	10-29-13	M. R. Co. Inc.	C. H. Wondries	18 ft. Concrete Base	49,521	22,091	71,612	4,886	76,498
D-31	53	•	•	19	A	Westerly Boundary	Riverside	9.32	3-16-15	Day Labor	C. H. Wondries	Oil Surfacing	3,719	3,627	7,346	877	8,223
12	14	III	Sacramento	3	A	Auburn Road	Northerly Boundary	1.65	9-25-12	Burns, Clark & Da Roza	W. P. Ireland	15 ft. Concrete, Oil Surfacing	10,891	4,823	15,714	2,730	18,444
112	128	•	•	11	A	Folsom	Easterly Boundary	6.83	11-10-14	A. W. & C. H. Gorrill	J. L. Piper	12 ft. Concrete Base	41,306	23,184	64,490	4,322	68,812
D-71	128	•	•	11	A	Folsom	Easterly Boundary	6.83		Day Labor	W. H. Miller	Oil Surfacing	3,828	2,413	6,241	93	6,334
42	51	V	San Benito	2	A	Westerly Boundary	San Juan Bautista	4.22	10-29-13	E. O. Burge	J. C. Alstrom	Grading	48,419	2,752	51,171	3,263	54,434
D-8	51	•	• •	2	A	San Juan Bautista	Northerly Boundary	4.05		Day Labor	K. Beck	15 ft. Concrete, Oil Surfacing	45,847	21,905	67,752	4,013	71,765
D-48	[illegible]	•	• •	2	A	Westerly Boundary	San Juan Bautista	5.21	12-7-15	Day Labor	H. S. Tolen	15 ft. Concrete Base	66,434	16,790	83,224	1,751	84,975
D-89	[illegible]	•	• •	2	A	Through San Juan Bautista		0.50	12-7-15	Day Labor	H. S. Tolen	15 ft. Concrete Base	6,183	3,618	9,801	138	9,939
46	59	VII	San Bernardino	9	A	Upland	Citrus Ave.	10.36	11-21-13	Hudson-Johnson Const. Co.	C. H. Wondries	18 ft. Concrete, Oil Surfacing	55,372	34,758	90,130	6,148	96,278
36	[illegible]	•	• •	9	B-C	Citrus Ave.	San Bernardino	5.63	6-11-13	C. J. Flower	C. H. Wondries	18 ft. Concrete, Oil Surfacing	34,312	17,189	51,501	4,907	56,408
33	[illegible]	•	• •	9	D	Westerly Boundary	Upland	1.68	2-26-14	Louis Ferrell	C. H. Wondries	18 ft. Concrete Base	16,321	6,334	22,655	2,365	25,020
D-46	[illegible]	•	• •	9	D	Westerly Boundary	Upland	1.59		Day Labor	C. H. Wondries	Oil Surfacing	242	761	1,003	23	1,026
37	[illegible]	•	• •	19	A-B	Westerly Boundary	Southerly Boundary	6.61	7-23-13	Bent & Pennybaker	L. R. Lothrop	16 ft. Concrete, Oil Surfacing	39,492	18,856	58,348	4,293	62,641
D-34	[illegible]	•	• •	19	B	Ontario	Southerly Boundary	0.13		Day Labor	L. R. Lothrop	16 ft. Concrete Base	957	736	1,693	15	1,708
7	7	VII	San Diego	2	A	San Diego	Encinitas	6.42	8-27-12	M. L. Curtis & Co.	A. W. Allen	15 ft. Concrete, Oil Surfacing	55,501	14,137	69,638	3,929	73,567
30	36	•	• •	2	B	Encinitas	Oceanside	10.63	5-21-13	J. M. Montgomery	A. W. Allen	15 ft. Concrete Base	60,308	23,940	84,248	4,017	88,265
D-11	[illegible]	•	• •	2	B-C	Encinitas	Las Flores	18.48		Day Labor	C. N. Ainley	Oil Surfacing	21,208	11,032	32,240	1,862	34,102
39	47	•	• •	2	C	Oceanside	Las Flores	6.03	9-24-13	C. L. Hyde Const. Co.	A. W. Allen	15 ft. Concrete Base	48,598	20,471	69,069	2,974	72,043
[illegible]	76	•	• •	2	D	Las Flores	Westerly Boundary	11.14	4-22-14	W. A. Perry	C. N. Ainley	15 ft. Concrete Base	77,553	29,607	107,160	8,032	115,192
D-58	76	•	• •	2	D	Las Flores	Westerly Boundary	11.14		Day Labor	C. N. Ainley	Oil Surfacing	9,682	5,502	15,184	150	15,334
D-90	76	•	• •	2	D	Las Flores	Westerly Boundary	0.05	10-25-15	Day Labor	J. G. Beckjord	15 ft. Concrete Base	7,230	449	7,679	293	7,972
[illegible]	77	•	• •	12	A	East San Diego	La Mesa	1.96	4-22-14	C. L. Hyde Const. Co.	E. S. Gripper	15 ft. Concrete Base	12,815	6,649	19,464	1,531	21,045
D-26	[illegible]	•	• •	12	A-B	East San Diego	El Cajon	3.52	1-22-15	Day Labor	L. W. Cummings	Oil Surfacing	3,640	1,366	5,006	561	5,567
94	[illegible]	•	• •	12	B	La Mesa	El Cajon	1.56	8-26-14	C. L. Hyde Const. Co.	E. S. Gripper	15 ft. Concrete Base	12,764	4,116	16,880	952	17,832
D-93	224	•	• •	12	C	El Cajon	Flinn Springs	7.23	12-7-15	Day Labor	J. G. Beckjord	15 ft. Concrete Base	32,859	44,834	77,693	1,920	79,613
56	[illegible]	V	San Luis Obispo	2	A	Paso Robles	Northerly Boundary	10.63	2-26-14	W. A. Dontanville	C. F. Price	15 ft. Concrete Base	72,027	55,102	127,129	5,554	132,683
154	[illegible]	•	• • •	2	B	Atascadero Creek	Paso Robles	10.05	6-10-15	J. D. Marsh	S. D. Cowden	15 ft. Concrete Base	69,040	48,498	117,538	5,302	122,840
[illegible]	57	•	• • •	2	C	Santa Margarita	Atascadero Creek	8.35	2-26-14	W. A. Dontanville	F. S. Rust	15 ft. Concrete, Oil Surfacing	64,121	45,285	109,406	3,771	113,177
D-3	[illegible]	•	• • •	2	D	San Luis Obispo	Santa Margarita	6.37	7-23-13	Day Labor	E. W. Upson	15 ft. Concrete, Oil Surfacing	65,751	35,179	100,930	6,489	107,419
110	138	•	• • •	2	D	San Luis Obispo Creek	Cuesta	3.60	10-20-14	Enoch J. Hunt	W. B. Burch	Grading	52,582	6,189	58,771	4,614	63,385
64	[illegible]	•	• • •	2	E	Arroyo Grande	San Luis Obispo	13.41	7-21-14	Rogers Bros. Co.	L. A. Moore	15 ft. Concrete Base	101,372	80,958	182,330	8,310	190,640
D-49	104	•	• • •	2	F	Arroyo Grande	San Luis Obispo	13.42		Day Labor	A. A. Peters	Oil Surfacing	5,606	2,890	8,496	527	9,023
D-73	104	•	• • •	2	F	Arroyo Grande	San Luis Obispo	2.84	6-26-15	Day Labor	A. A. Peters	Guard Rail	4,586		4,586	104	4,690
D-115	265	•	• • •	2	F	Santa Maria River	Nipomo	1.95	12-15-16	Day Labor	F. K. Dunshee	Grading	4,908	14	4,922	79	5,001

COMPLETED CONTRACTS—Continued.

	L.O.							Length	Contract				Final Estimate			Engineering during	
Con.No.	No.	Div.	County	Rte.	Sec.	From	To	(Miles)	Date	Contractor	Resident Engineer	Type of Work	Work	Materials	Total	Construction	Total
1	1	IV	San Mateo	2	A	South San Francisco	Burlingame	5.41	7-23-12	F. R. Ritchie & Co.	Leon L. Clarke	24 ft. Asphalt on Concrete	92,899	135	93,034	3,968	97,002
29	21	"	" "	2	A	Oak Grove Drive	Bellevue Drive, Burlingame	.22	4-25-13	Clark & Henery Const. Co.	Leon L. Clarke	24 ft. Topeka on Concrete	4,185	1,282	5,467	514	5,981
26	33	"	" "	2	A	Northerly Boundary	South Line Daly City	1.02	4-25-15	Flynn & Treacy	A. C. Saxe	24 ft. Topeka on Concrete	14,589	6,302	20,891	2,937	23,828
34	37	"	" "	2	A	Cypress Lawn Cemetery	South San Francisco	2.07	7-3-13	Mahoney Bros.	H. F. Holley	Grading	22,385	5,375	27,760	2,837	30,597
54	[illegible]	"	" "	2	A	Daly City	Cypress Lawn Cemetery	4.05	2-26-14	Bates, Borland & Ayer	A. C. Saxe	24 ft. Topeka on Concrete	70,699	23,590	94,289	5,637	99,926
22	22	"	" "	2	B	Redwood City	Southerly Boundary	3.29	3-26-13	S. P. Doyle	Leon L. Clarke	20 ft. Topeka on Macadam	50,991		50,991	2,637	53,628
D-9	[illegible]	"	" "	2	B	At San Francisquito Creek		.18		Day Labor		20 ft. Bituminous Concrete	1,413	4,591	6,004	235	6,239
D-26	22	"	" "	2	B	Redwood City	Southerly Boundary			Day Labor	E. Blockley	Retaining Wall	715	367	1,082	352	1,434
37	34	"	" "	2	B	San Mateo	Beresford	1.76	4-25-13	Raisch Imp. Co.	Leon L. Clarke	20 ft. Topeka on Macadam	27,826	404	28,230	1,896	30,126
147	239	"	" "	2	B	Beresford	Redwood City	4.24	7-10-16	J. A. Marshall	Clay Anderson	20 ft. Concrete Base	40,474	38,253	78,727	4,638	83,365
93	105	V	Santa Barbara	2	A	Orcutt	Santa Maria River	6.49	8-26-14	Arthur S. Bent Const. Co.	E. S. Rust	15 ft. Topeka on Concrete	66,531	32,275	98,806	3,212	102,018
D-72	105	"	" "	2	A	Santa Maria	Santa Maria River	0.82	12-7-15	Day Labor	A. A. Peters	Oiled Gravel	700	50	750	22	772
37	41	"	" "	2	B	Los Alamos	Bicknell	11.95	7-3-13	Mayer & Lewis	L. C. Cain	15 ft. Concrete, Oil Surface	88,431	60,505	148,936	10,482	159,418
153	192	"	" "	2	D	Gaviota Pass	Zaca Station	11.39	8-10-15	C. H. Hudson	W. L. Judkins	Grading	53,714	10,944	64,658	5,123	69,781
176	248	"	" "	2	D	Santa Ynez River Bridge		.68	9-11-16	Mercer-Fraser Co.	E. S. Brown	Steel Bridge	167,102	8,390	175,492	6,238	181,730
113	134	"	" "	2	E	Alcatraz	Las Cruces	4.82	12-8-14	J. W. Culback	O. C. Tretten	15 ft. Concrete Base	74,976	29,036	104,012	5,574	109,586
152	271	"	" "	2	E	Las Cruces	Gaviota Pass	2.93	5-22-17	Ira Hodson	R. S. Henderson	Grading	55,886	9,273	65,159	3,438	68,597
92	115	"	" "	2	F	El Capitan Creek	Alcatraz	9.31	8-11-14	T. K. Beard	J. C. Alstrom	Grading	88,030	9,878	97,908	5,747	103,655
109	123-124	"	" "	2	G-I	El Capitan Creek	Stony Creek	10.20	10-6-14	C. H. Hudson	W. P. Marshall	Grading	99,089	22,807	121,896	5,627	127,523
45	58	"	" "	2	H	Rincon Creek	Carpinteria Creek	2.35	11-21-13	Occidental Const. Co.	B. W. Upson	15 ft. Concrete Base	22,055	8,125	30,180	3,101	33,281
D-16	153	"	" "	2	J	County Road	Serena Station	.69		Day Labor	B. W. Upson	15 ft. Concrete Base	4,830	3,322	8,152	1,220	9,372
14	8	IV	Santa Clara	2	A	Palo Alto	Stevens Creek Bridge	6.43	10-22-12	City Street Imp. Co.	E. Blockley	20 ft. Topeka on Macadam	103,688	285	103,973	5,619	109,592
15	8	"	" "	2	A	Stevens Creek Bridge	Lawrence Station Road	5.52	10-22-12	A. Teichert & Son	Chas. B. Dugan	20 ft. Concrete, Oil Surface	35,110	19,242	54,352	3,065	57,417
32	37	"	" "	2	A	Lawrence Station Road	Santa Clara	1.15	5-21-13	John Doyle	Chas. B. Dugan	20 ft. Concrete Base	11,240	5,554	16,794	1,947	18,741
68	111	"	" "	2	A	Santa Clara	San Jose	1.93	8-11-14	Ransome-Crummey Co.	Leon L. Clarke	24 ft. Topeka on Concrete	19,001	26,739	45,740	6,143	51,883
D-10	8-84	"	" "	2	A	At San Francisquito Creek		.08		Day Labor		20 ft. Bituminous Concrete	636	2,042	2,678	109	2,787
23	23	"	" "	2	B	Edenvale	Morgan Hill	12.95	3-26-13	Richard Keatinge & Sons	Chas. B. Dugan	15 ft. Concrete, Oil Surface	63,931	48,007	111,938	4,484	116,422
28	35	"	" "	2	B	San Jose	Edenvale	4.35	4-25-13	Richard Keatinge & Sons	Chas. B. Dugan	15 ft. Concrete, Oil Surface	26,726	10,359	37,085	1,329	38,414
64	35	"	" "	2	B	San Jose	Mulia	1.64	4-22-14	John W. McDonald, Jr.	Chas. B. Dugan	Topeka Surfacing	14,549	564	15,133	588	15,721
D-21	139	"	" "	2	B	At Morgan Hill		.40	11-5-14	Day Labor	E. Blockley	15 ft. Concrete Base	3,590	1,184	4,774	629	5,403
35	40	"	" "	2	C	Morgan Hill	Gilroy	7.59	7-3-13	E. O. Burge	J. D. Greene	15 ft. Concrete Base	37,476	19,643	57,119	4,301	61,420
72	96	"	" "	2	C	Gilroy	Sargent	6.07	6-9-14	H.L. Peterson & A.J.Grier	Wm. H. Jaenicke	15 ft. Concrete Base	49,250	29,403	78,653	3,326	81,979
D-17	96	"	" "	2	C	Morgan Hill	Sargent	13.59		Day Labor	Wm. H. Jaenicke	Oil Surfacing	5,397	2,406	7,803	458	8,261
D-18	40-65	"	" "	2	C	At Llagas Creek		.26		Day Labor	E. Blockley	15 ft. Concrete Base	6,995	1,595	8,590	1,572	10,162
99	112	"	" "	5	A	Northerly Boundary	San Jose	5.79	8-11-14	John W. McDonald, Jr.	Chas. B. Dugan	18 ft. Concrete Base	40,342	27,909	68,251	4,722	72,972
D-63	112	"	" "	5	A	Northerly Boundary	San Jose	6.79	8-4-15	Day Labor		Oil Surfacing	3,357	2,368	5,725	97	5,822
102	132	"	" "	5	B	Southerly Boundary	Los Gatos	7.59	9-22-14	John A. Marshall	Clay Anderson	Grading	97,071	7,356	104,427	10,376	114,803
146	183	"	" "	5	B	Los Gatos	San Jose	8.89	7-23-15	Marin Rock Co.	Chas. B. Dugan	18 ft. Concrete Base	43,236	37,676	80,912	4,081	84,993
D-78	183	"	" "	5	B	Los Gatos	San Jose	.89	10-11-15	Day Labor		Fencing	43		43	4	47
49	68	IV	Santa Cruz	5	A	Easterly Boundary	Glenwood	5.66	2-26-14	Martin Foss & J.A.Marshall	N. W. McCluskey	Grading	78,823	6,377	85,200	7,341	92,541
83	103	"	" "	5	A	Glenwood	Santa Cruz	10.10	7-7-14	Occidental Const. Co.	W. A. Moore	Grading	81,699	4,719	86,418	12,621	99,039
88	100-101	II	Shasta	3	B-C	Bayha	Sacramento River	16.21	7-21-14	Palmer & McBryde	C. E. Smith	Grading	219,448	13,094	232,542	20,330	252,872
D-47	182	"	"	3	B	Sacramento River at Redding		.09	6-25-15	Day Labor	B. L. Breed	Grading	2,547	539	3,086	183	3,269
144	186	"	"	3	B	Pit River Bridge		.07	7-20-15	Ross Construction Co.	C. E. Smith	Concrete Bridge	22,943	14,032	36,975	1,426	38,401
174	238	"	"	3	C	Salt Creek and Sacramento River Bridges		.15	7-28-16	Ross Construction Co.	H. H. Soult	Concrete Bridges	25,024	14,981	40,005	1,120	41,125
75	85	"	"	3	D	La Moine	Hazel Creek	9.92	6-9-14	F. Rolandi	E. J. Bassett	Grading	91,332	8,355	99,687	11,064	110,751
148	187	"	"	3	D	Boulder Creek & Shotgun Creek Bridges		.13	7-20-15	F. Rolandi	E. J. Bassett	Concrete Bridges	5,393	3,715	9,108	672	9,780
D-83	187	"	"	3	D	At Boulder Creek & Shotgun Creek			11-10-15	Day Labor		Grading	360		360	14	374
100	130	II	Siskiyou	3	A	Weed	Dunsmuir	16.60	9-22-14	Tooney & Johnson	H. C. Boyden	Grading	88,664	6,097	94,761	9,380	104,141
155	310	"	"	3	A	Dunsmuir Bridge		0.10	8-24-15	F. H. Greene	H. H. Soult	Concrete Bridge	26,946	18,485	45,431	1,665	47,096
160	320	"	"	3	A-B	Greenhorn, Yreka & Little Castle Cr. Bridges		0.34	5-22-17	John H. May	H. H. Soult	Concrete Bridges	6,509	3,021	9,530	870	10,400
66	84	"	"	3	C	Hornbrook	Oregon Line	8.03	5-27-14	Mason & Fradenburgh	S. W. Lowden	Grading	37,751	6,444	44,195	8,770	52,965
118	145	"	"	3	C	Hornbrook	Yreka	16.92	12-22-14	E. T. Johnson	S. W. Lowden	Grading	134,887	11,812	146,699	21,039	167,738
D-99	84-145	"	"	3	C	Yreka	Oregon Line	0.25	3-16-16	Day Labor	L. H. Taylor	Grading	3,129		3,129	35	3,164
79	79	III	Solano	7	A	Benicia	2½ miles S. of Cordelia	9.05	6-9-14	Commary-Peterson Co. Inc.	S. J. Treadaway	15 ft. Concrete Base	54,310	40,703	95,013	7,922	102,935
114	144	"	"	7	B	2½ miles S. of Cordelia	Fairfield	8.13	11-20-14	P. H. Hoare	M. T. Heaton	15 ft. Concrete Base	39,998	31,670	71,668	3,951	75,519
D-60	144	"	"	7	B	2½ miles S. of Cordelia	Fairfield	8.06		Day Labor	J. T. Haviland	Oil Surfacing	1,674	2,376	4,050	149	4,199
74	94	"	"	7	C	Fairfield	Vacaville	8.85	6-9-14	Commary-Peterson Co. Inc.	A. T. Howe	15 ft. Concrete Base	57,255	41,195	98,450	5,319	103,769
111	127	"	"	7	D	Vacaville	Batavia	8.24	11-10-14	P. L. Burr	L. F. Vaile	15 ft. Concrete Base	53,455	30,798	84,253	5,582	89,835

COMPLETED CONTRACTS—Concluded.

Con. No.	L.O. No.	Div.	County	Rte.	Sec.	From	To	Length (Miles)	Contract Date	Contractor	Resident Engineer	Type of Work	Final Estimate Work	Final Estimate Materials	Final Estimate Total	Engineering during Construction	Total
[illegible]	[illegible]	IV	Sonoma	1	A	Northerly Boundary	Cloverdale	4.29	[illegible]-7-14	Hard Bros.	G. W. Wade	Grading	52,392	3,361	55,753	7,892	63,645
[illegible]	[illegible]	•	•	1	B	Healdsburg	Santa Rosa	13.45	10-22-12	Richard Keatings & Sons	I. M. Atkinson	15 ft. Concrete, Oil Surfacing	133,658	64,051	197,709	8,740	206,449
D-[illegible]	[illegible]	•	•	1	[illegible]	[illegible] of Healdsburg		0.04	10-30-14	Day Labor		Gravel Surface	116		116	70	186
D-[illegible]	[illegible]	•	•	1	[illegible]	Sta. [illegible]	Sta. 144+[illegible]	[illegible].25		" "	J. J. Stockard	15 ft. Concrete Base	11,321	1,661	12,982	1,441	14,423
D-[illegible]	[illegible]	•	•	1	[illegible]	Healdsburg	Russian River	[illegible].58	12-7-15	" "	C. C. Cottrell	15 ft. Concrete Base	3,639	1,489	5,128	87	5,215
[illegible]	[illegible]	•	•	1	[illegible]	Willow Brook	Southerly Boundary	5.44	4-30-15	Twohy Bros. Co.	A. C. Saxe	15 ft. Concrete Base	45,668	28,123	73,791	4,405	78,196
[illegible]	[illegible]	•	•	1	[illegible]	[illegible] Ave.	Willow Brook	[illegible].60	[illegible]-11-16	W.C.Price & Co.	L. C. Winkelman, Jr	Grading	24,127	3,087	27,214	3,261	30,475
[illegible]	[illegible]	•	•	[illegible]	A	[illegible]	[illegible]rville	7.05	11-23-15	Bates, Borland & Ayer	J. D. Greene	Grading	47,575	4,667	52,242	4,065	56,307
D-[illegible]	[illegible]	•	•	5	A-B	Sonoma Creek	Easterly Boundary	[illegible].32	5-24-15	Day Labor	I. M. Atkinson	Grading	19,096	1,019	20,115	1,630	21,745
[illegible]	5[illegible]	III	Stanislaus	4	A	Southerly Boundary	Ceres	1[illegible].04	5-27-12	E. O. Burge	J. F. Piper	15 ft. Concrete, Oil Surfacing	66,072	23,153	89,225	4,290	93,515
[illegible]	[illegible]	•	•	4	B	Ceres	Northerly Boundary	[illegible].61	3-[illegible]-15	Considine & Bates Co	R. R. Hatchett	15 ft. Concrete, Oil Surfacing	33,447	37,003	70,450	7,551	78,001
D-[illegible]	[illegible]	•	•	4	B	Tuolumne River Bridge		[illegible].02	5-21-17	Day Labor		15 ft. Concrete Base	461		461		461
[illegible]	2[illegible]4	•	•	13	A	[illegible]	Oakdale	13.81		Day Labor	W. A. Mason	12 ft. Concrete Base	61,130	41,444	102,574	4,803	107,377
D-[illegible]	1[illegible]4	•	•	13	B	[illegible] Ferry Road	Easterly Boundary	[illegible].32	10-20-14	Day Labor	H. C. Darling	Grading	6,342	252	6,594	139	6,733
[illegible]	1[illegible]	III	Sutter	3	A	[illegible] City	Northerly Boundary	11.70	1-19-15	Forest City Pav & Const.Co	C. M. Butts	15 ft. Concrete Base	50,947	45,197	96,144	5,438	101,582
[illegible]	1[illegible]	II	Tehama	3	B	Proberta	Red Bluff	[illegible].58	6-1-15	Hoffman & McLaren	E. Q. Sullivan	15 ft. Concrete Base	40,632	16,701	57,333	4,675	62,008
[illegible]	[illegible]	•	•	[illegible]	[illegible]	[illegible]	Proberta	9.75	1-11-16	Taylor & Berliner	E. Q. Sullivan	15 ft. Concrete Base	54,295	26,476	80,771	7,569	88,340
[illegible]	17[illegible]	•	•	[illegible]	[illegible]	Red Bluff	Northerly Boundary	1[illegible].74	7-20-15	James Fitzpatrick	J. A. McDavitt	Grading	46,786	4,393	51,179	5,131	56,310
[illegible]	66	•	•	[illegible]	A	Southerly Boundary	Corning	[illegible].81	6-9-14	Burns, Jacinto & Da Roza	E. Q. Sullivan	15 ft. Concrete Base	56,267	20,307	76,574	5,428	82,002
[illegible]	[illegible]6	•	•	[illegible]	A	Southerly Boundary	Corning	5.23		Day Labor	J. T. Haviland	Oil Surfacing	2,439	652	3,091	502	3,593
[illegible]	[illegible]	VI	Tulare	4	A	Earlimart	Pixley	[illegible].67	6-6-17	Geo. S. Benson & Sons	J. J. White	15 ft. Concrete Base	36,976	26,577	63,553	1,578	65,131
[illegible]	[illegible]	•	•	4	A	Southerly Boundary	Earlimart	[illegible].63	6-6-17	The M. R. Co. Inc.	R. C. Myers	15 ft. Concrete Base	35,711	27,882	63,593	2,242	65,835
[illegible]	[illegible]	•	•	4	[illegible]	Pixley	Tipton	[illegible].36	7-[illegible]-17	Leigh G. Garnsey	R. S. Badger	15 ft. Concrete Base	38,603	32,444	71,047	2,164	73,211
[illegible]	[illegible]	•	•	[illegible]	[illegible]	Goshen	Visalia	[illegible].42	5-10-15	White & Gaskill	A. F. Carlinghouse	15 ft. Concrete Base	34,645	27,293	61,938	4,094	66,032
[illegible]	[illegible]	•	•	4	E	Traver	Northerly Boundary	[illegible].20	4-16-15	W.A. Kettlewell & Sons	C. V. James	15 ft. Concrete Base	24,504	22,808	47,312	2,321	49,633
[illegible]	[illegible]	•	•	4	E	Goshen	Traver	[illegible].47	4-16-15	W.A. Kettlewell & Sons	C. V. James	15 ft. Concrete Base	35,656	33,881	69,537	5,514	75,051
D-[illegible]	[illegible]	•	•	4	E	Traver	Northerly Boundary	[illegible].35	1-7-16	Day Labor	B. J. Pardee	Oil Surfacing	660	731	1,391	73	1,464
[illegible]	[illegible]	•	•	4	E	Goshen	Trayer	[illegible].39	1-7-16	Day Labor		Oil Surfacing	10		10		10
[illegible]	17[illegible]	•	•	10	A	Westerly Boundary	Near Goshen	[illegible].94	[illegible]-10-15	White & Gaskill	A. F. Carlinghouse	15 ft. Concrete Base	14,437	15,006	29,443	2,158	31,601
D-6	[illegible]	III	Tuolumne	13	A	Westerly Boundary	Keystone	10.64		Day Labor	H. C. Darling	Grading	68,357	2,722	71,079	2,687	73,766
D-[illegible]	[illegible]	"	•	13	B	Keystone	Sonora	11.01	3-26-15	Day Labor	H. C. Darling	Grading	41,779	3,597	45,376	2,640	48,016
[illegible]	[illegible]	VII	Ventura	2	A	Southerly Boundary	Newbury Park	7.54	5-21-13	Leigh G. Garnsey	H. R. Postle	15 ft. Concrete Base	52,692	22,472	75,164	4,126	79,290
D-[illegible]	[illegible]	•	•	2	A	Southerly Boundary	Newbury Park	7.54		Day Labor	H. R. Postle	Oil Surfacing	13,847	2,878	16,725	552	17,277
[illegible]	[illegible]	•	•	2	B	Newbury Park	Springville	11.15	7-7-14	Leigh G. Garnsey	Chas. G. Kolster	15 ft. Concrete, Oil Surfacing	121,272	30,059	151,331	8,030	159,361
[illegible]	[illegible]	•	•	2	B	[illegible] Bridge		[illegible].01	7-28-16	Munoz & Munoz	L. W. Cummings	Concrete Bridge	3,280	1,234	4,514	678	5,192
[illegible]	[illegible]	•	•	2	C	[illegible]ville	Santa Clara River	[illegible].63	7-10-16	Modern Const. Co.	L. W. Cummings	15 ft. Concrete Base	31,565	14,842	46,407	2,931	49,338
[illegible]	[illegible]	•	•	2	C	Santa Clara River	Ventura	4.16	[illegible]-6-17	Conner Cont. Co.	J. C. More	15 ft. Concrete Base	28,346	17,262	45,608	3,039	48,647
[illegible]	[illegible]	•	•	2	D-E	[illegible]	Sea Cliff	[illegible].02	[illegible]-26-14	Carl Leonardt	E. E. East	15 ft. Concrete Base	101,996	33,246	135,242	4,498	139,740
D-[illegible]	[illegible]	•	•	2	D-E	[illegible]	Sea Cliff	[illegible].02		Day Labor	E. E. East	Oil Surfacing	3,826	2,087	5,913	771	6,684
D-[illegible]	[illegible]	•	•	2	F	Sea Cliff	Rancho El Rincon	1.29	[illegible]-28-12	Day Labor	E. E. East	Sea Walls and Trestle	23,196	2,215	25,411	9,077	34,488
[illegible]	[illegible]	•	•	2	F-G	[illegible]	Westerly Boundary	[illegible].70	5-9-14	Modern Const. Co Inc	E. E. East	15 ft. Concrete Base	52,489	18,620	71,109	3,467	74,576
D-43	[illegible]	•	•	2	F-G	[illegible]	Westerly Boundary	4.36		Day Labor	E. E. East	Oil Surfacing	1,487	1,504	2,991	572	3,563
[illegible]	[illegible]	III	Yolo	6	A	Davis	Yolo By-Pass	4.80	4-5-15	Palmer & McBryde	E. H. Hatch	18 ft. Concrete Base	53,371	33,039	86,410	5,832	92,242
D-[illegible]	[illegible]	•	•	6	A	Davis	Webster	4.29		Day Labor	W. H. Miller	Oil Surfacing	2,696	2,702	5,398	151	5,549
D-[illegible]	[illegible]	•	•	6	A	Station 104+[illegible]	Station 121+62	.41	5-10-15	Day Labor	F. C. Hewitt	18 ft. Concrete Base	2,534	2,319	4,853	122	4,975
D-[illegible]	[illegible]	•	•	6	A	[illegible]			5-17-16	Day Labor		Gravel Surface	20		20		20
[illegible]	[illegible]	•	•	6	B	[illegible] By-Pass		3.13	7-21-14	Graff Const. Co.	B. C. Gerwick	Concrete Bridge	254,930	150,024	404,954	18,637	423,591
[illegible]	[illegible]	•	•	6	B	[illegible] Bridge		4.03	1[illegible]-7-15	Security Const. Co.	C. M. Butts	Steel Bridge	25,556	2,603	28,159	2,784	30,943
[illegible]	[illegible]	•	•	6	C	[illegible]-Pass	Sacramento River	[illegible].69	4-16-15	Joe Lawrence	U. S. Marshall	18 ft. Concrete Base	32,128	17,790	49,918	3,799	53,717
D-[illegible]	[illegible]	•	•	6	C	[illegible]-Pass	Sacramento-Woodland Ry.	[illegible].70		Day Labor	W. H. Miller	Oil Surfacing	1,122	1,124	2,247		2,247
[illegible]	[illegible]	•	•	7	A	Southerly Boundary	Woodland	1[illegible].73	7-7-14	M. Blumenkranz	U. S. Marshall	15 ft. Concrete Base	54,552	50,336	104,888	5,282	110,170
D-[illegible]	[illegible]	•	•	[illegible]	A	Southerly Boundary	Woodland	1[illegible].91		Day Labor	W. H. Miller	Oil Surfacing	2,423	603	3,025	201	3,227
D-[illegible]	[illegible]	•	•	7	A	Station [illegible]			1-20-16	Day Labor		Pipe Culvert		20	20		20
[illegible]	[illegible]	III	Yuba	3	A	Southerly Boundary	Morrisons Crossing	5.33	4-16-15	E.E.Roddan & Son	W. P. Ireland	15 ft. Concrete Base	22,417	11,590	34,007	3,203	37,210
[illegible]	[illegible]	•	•	3	B	Morrison's Crossing	Marysville	9.21	7-23-12	F. E. Frey	H. C. Bryden	15 ft. Oil Macadam	67,430	270	67,700	4,944	72,644

UNCOMPLETED CONTRACTS.

Con. No.	L.O. No.	Div.	County	Rte.	Sec.	From	To	Length (Miles)	Contract Date	Contractor	Resident Engineer	Type of Work	Expenditures To June 30, 1918			Engineering during Construction	Total
													Work	Materials	Total		
192	284	IV	Alameda	5	A	Altamont	Greenville	3.68	7-2-17	Bates, Borland & Ayer	H. C. Boyd	15 ft. Concrete Base	40,289	16,715	58,924	8,028	66,952
D-119	132	•	•	5	C	Niles Undergrade Crossing		0.09	2-13-17	Day Labor		Concrete Base	587	546	1,133	296	1,429
330	357	•	•	5	C	Overacker's Corners	Southerly Boundary	8.40	7-19-18	O. G. Ritchie	E. Blockley	15 ft. Concrete Base					
207	[illegible]	III	Butte	3	A	Southerly Boundary	Biggs	7.70	10-17-17	Municipal Imp. Co.	J. L. Piper	15 ft. Concrete Base	8,222	6,178	14,400	2,564	16,964
D-196	317	•	•	3	B	Biggs	Nelson	12.42		Day Labor		15 ft. Concrete Base					
D-202	154	•	•	3	C	South Butte Creek Bridge				Day Labor		15 ft. Concrete Base					
227	346	•	•	21	A	Oroville	Shippee Road	6.38	7-2-18	M. Blumenkranz	C. M. Butts	15 ft. Concrete Base					
228	351	III	Calaveras	24	A	Westerly Boundary	Valley Springs	9.66	7-2-18	Frank C. McIntyre	M. C. Ayers	Grading					
D-203		III	Colusa	7	B	At Crossing Colusa & Lake	R.R.			Day Labor		15 ft. Concrete Base					
D-204		•	•	7	C	Station 222+00				Day Labor		15 ft. Concrete Base					
201	[illegible]	IV	Contra Costa	14	B	Hercules	Eckley	5.45	8-28-17	Whitlock & Gorrill	L.C.Winkelman,Jr.	15 ft. Concrete Base	22,063	16,778	38,861	3,023	41,884
D-163	133	•	• •	14	B	Eckley	Martinez	6.49	8-28-17	Day Labor	C.F. Price	15 ft. Concrete Base	54,606	21,547	76,153	3,024	79,177
D-209		•	• •	14	B	Valona				Day Labor		Concrete Retaining Walls					
D-173	[illegible]	III	El Dorado	11	A	White Rock	Shingle Springs	10.28	11-28-17	Day Labor	O. P. Dodds	12 ft. Concrete Base	46,191	16,266	62,457	1,659	64,116
D-205		III	Glenn	7	B	Walker Creek Bridge				Day Labor		15 ft. Concrete Base					
211	302	I	Humboldt	1	E	Garberville	Miranda	15.61	11-19-17	Palmer & McBryde	E. M. Cameron	Grading	65,457	13,382	78,869	4,156	83,025
D-155	91	•	•	1	D	Station 0+00	13+00	0.25	9-13-17	Day Labor	Wynn Meredith	Grading	4,442	161	4,603		4,603
225	297	•	•	1	F	Rio Dell	Fortuna	6.51	9-18-17	A.Robinson & R.R. Smith	Wynn Meredith	Grading	37,674	4,229	41,903	2,531	44,434
220	343	•	•	1	H	Eureka	Arcata	6.17	3-13-18	Mercer-Fraser Co.	R. L. Thomas	Grading	6,517		6,517	1	6,518
D-165	214	VII	Imperial	12	C	At Brawley Main Canal				Day Labor		15 ft. Concrete Base					
D-183	214	•	•	12	C	New River Bridge			1-5-18	Day Labor		15 ft. Concrete Base	2,606		2,606	79	2,685
D-214		•	•	26	C	Kane Springs	Tule Wash	11.08	1-2-19	Day Labor		8 ft. Concrete Base					
D-114	263	VI	Inyo	23	B	Division Creek	Fish Spring School	10.35		Day Labor	C. C. Boyer	8 ft. Concrete Base	26,940	2,576	29,516	688	30,204
226	333	II	Lassen	29	B	Coppervale	Susanville	14.90	7-2-18	J. P. Moffett	J. N. Bidwell	Grading					
D-117	333	•	•	29	B	Near Susanville			1-29-17	Day Labor		Culverts	317	447	764		764
D-199		VII	Los Angeles	4	A	At Newhall Property				Day Labor		Fence Right of Way					
D-127	98-151	•	• •	4	BCD	Castaic School	Northerly Boundary		5-14-17	Day Labor	C. S. Grace	Widening Grade	30,740		30,740	205	30,945
D-146	151	•	• •	4	C	Ridge Route			7-16-17	Day Labor	C. T. Scott	Moving Pipe Line	2,527	1,227	3,754		3,754
D-174	151	•	• •	4	C	Ridge Route			11-25-17	Day Labor	C. S. Grace	Quarries	1,318		1,318		1,318
D-178	98-151	•	• •	4	C-D	Station 567 Sec. C	Station 128 Sec. D	6.76		Day Labor		20 ft. Concrete Base	45,446	14,546	59,992	1,102	61,094
D-166	98	•	• •	4	D	Lieure Mountain	Northerly Boundary	4.28	10-11-17	Day Labor	C. G. Kolster	Oiling Graded Road	3,081		3,081	211	3,292
213	301	•	• •	9	A	San Fernando	Rancho Tujunga	10.02	11-19-17	A.L.McCray & G.H.Oswald	C. F. Spellmeyer	15 ft. Concrete Base	54,099	11,775	65,875	3,079	68,954
D-190	259	•	• •	9	I	Near Glendora				Day Labor		Bank Protection	400	9,013	9,413		9,413
D-167		•	• •	23	B	Santa Clara River Bridge				Day Labor		Concrete Bridge	443	1,178	1,621		1,621
D-130	281	•	• •	23	D	Seeleys Ranch	Acton	10.60	7-18-17	Day Labor	C. N. Ainley	20 ft. Concrete Base	105,349	71,944	177,293	4,055	181,348
D-179	290	•	• •	23	E	Acton	Palmdale	8.64	1-16-18	Day Labor		20 ft. Concrete Base	15,573	1,433	17,006	641	17,647
208	299-188	IV	Marin	1	A	Northerly Boundary	San Rafael	15.96	10-17-17	Edmund J. Treacy	H. T. Brown	15 ft. Concrete Base	41,602	12,382	54,184	3,554	57,738
D-110	254	•	•	8	A	Station 12+00	Station 150+00	2.23	8-24-16	Day Labor	J. G. Greene	Grading	14,191	75	14,266	1,231	15,497
234	254	•	•	8	A	Ignacio	Black Point			H. C. Flinn		Grading					
D-111		VI	Mariposa	18	A	Owens Creek Bridge		0.02		Day Labor	R. S. Badger	Concrete Bridge	4,211	1,189	5,400	443	5,843
D-113	206	•	•	18	A	Westerly Boundary	Station 561+00		7-13-17	Day Labor		Oiling Graded Road	1,552	322	1,875	28	1,903
D-105	245	•	•	18	B	Cathay-White Rock Road	Aqua Fria Creek	7.83	7-28-16	Day Labor	R. S. Badger	Grading	134,439	7,118	141,557	5,049	146,606
D-170	319	•	•	18	C	Aqua Fria Creek	Mariposa	6.62	10-17-17	Day Labor	S. T. Corfield	Grading	74,912	3,050	77,962	1,715	79,677
215	289	I	Mendocino	1	F	Willits	Arnold	1.24	12-19-17	Erickson & Petterson	F. W. Howard	Grading	68,101	7,316	75,413	2,480	77,898
232	289	•	•	1	F	Outlet Creek Bridge			7-19-18	C. H. Gildersleeve	F. W. Howard	Concrete Bridge					
D-208		•	•	1	G	Arnold	Sherwood-Laytonville Jct.	10.19		Day Labor		Grading					
D-195	362	•	•	1	H	Sherwood-Laytonville Jct.	Rattlesnake Summit	13.76	6-7-18	Day Labor		Grading					
D-176	18	VI	Merced	4	A	Station 261+13			12-31-17	Day Labor		15 ft. Concrete Base	99	27	126		126
D-182	18	•	•	4	A	Station 463+15	Station 463+47	0.01	1-24-18	Day Labor		15 ft. Concrete Base	1	81	82		82
D-177	12	•	•	4	C	Station 664+33			12-31-17	Day Labor		15 ft. Concrete Base	962	34	996	341	1,337
D-145	6	•	•	4	D	Station 6+08 & 7+41			7-5-17	Day Labor		15 ft. Concrete Base	13		13		13
D-185	6	•	•	4	D	Sta.7+15, 104+00 & 247+00			2-14-18	Day Labor		Concrete Bridges	2,589	1,440	4,029	37	4,066

UNCOMPLETED CONTRACTS—Continued.

Con. No.	L.C. No.	Div.	County	Rte.	Sec.	From	To	Length (Miles)	Contract Date	Contractor	Resident Engineer	Type of Work	Expenditures To June 30, 1918: Work	Materials	Total	Engineering during Construction	Total
[illegible]		VI	Mono	23	B	[illegible] Creek Bridge			5-15-17	Day Labor	C. C. Boyer	Concrete Bridge	6,345	1,897	8,242	189	8,431
[illegible]		"	"	23	B	Station [illegible]	Station 155+00	3.28	4-30-18	Day Labor	C. C. Boyer	Grading	381		381		381
[illegible]		"	"	23	C	Hilton & McGee Creek Bridges			5-15-17	Day Labor	C. C. Boyer	Concrete Bridges	[illegible]	890	4,345	92	4,437
[illegible]		"	"	23	D	Convict & Hot Creek Bridges			5-15-17	Day Labor	C. C. Boyer	Concrete Bridges	6,61[illegible]	639	7,2[illegible]	546	7,805
[illegible]		"	"	23	E	Station 0+00	Station 10+00	0.19	7-15-18	Day Labor	C. C. Boyer	Grading					
[illegible]	236	"	"	23	F	Deadman Creek	Devils Punchbowl	3.11	4-24-18	Day Labor	C. C. Boyer	Grading	17,0[illegible]	1,889	18,937	578	19,515
D-194	352	"	"	23	G	Devils Punchbowl	Tioga Road	11.70	6-19-18	Day Labor	C. C. Boyer	Grading					
D-162	52	V	Monterey	2	A	Station 210+00	Station 530+00	9.20	9-26-17	Day Labor	A. S. Moore	Oil Surfacing	2,487	1,563	4,050		4,050
D-163	174	"	"	2	B	Station 0+00	Station 540+00	10.[illegible]	9-26-17	Day Labor		Oil Surfacing	1,980	1,622	3,602		3,602
216	323-329	"	"	2	E-F	Layout No. [illegible]	San Lucas	11.[illegible]	1-9-18	Geo. S. Benson & Sons	R. S. Henderson	15 ft. Concrete Base	[illegible]	3[illegible],233	71,861	1,801	73,662
D-211	312	"	"	2	R	Thompson Gulch Bridge		0.32		Day Labor		Grading					
D-192		"	"	2	F	King City Bridge				Day Labor		Test Borings	18		18		18
236	313	"	"	2	G	San Ardo	San Lucas	11.11		F. C. McIntyre	C. S. Gale	15 ft. Concrete Base					
D-188	313	"	"	2	G	San Ardo	San Lucas			Day Labor		Stock Pile Materials	3,400	11,294	14,694	82	14,776
233	358	"	"	2	I	Southerly Boundary	5 mi. N.W. of Bradley	10.24	7-19-18	J. L. Conner	K. Beck	15 ft. Concrete Base					
193	197	IV	Napa	5	B	Napa	Easterly Boundary	8.65	7-2-17	Worswick Const. Co.	Hal J. Sams	15 ft. Concrete Base	43,554	28,363	71,917	4,122	76,039
209	329-330	III	Nevada	17	A-B	Southerly Boundary	Nevada City	17.56	11-19-17	Augustus J. Fairbanks	M. T. Heaton	15 ft. Concrete Base	[illegible]	5,099	67,384	2,368	69,752
D-175		"	"	15	A	Nevada City	Northerly Boundary		12-28-17	Day Labor	L. H. Taylor	Grading	11,562	2,984	14,546	214	14,760
D-160	155	VII	Orange	2	A	Near Serra			9-24-17	Day Labor		15 ft. Concrete Base	1,392	1,063	2,455	113	2,568
D-164	116	"	"	2	B	Aliso Creek Bridge			10-4-17	Day Labor		Concrete Bridge	197	290	487		487
[illegible]	205	III	Placer	3	B	Yankee Slough Bridges, 1 and 2				Day Labor	C. M. Butts	Grading	388		388	305	693
[illegible]	205	"		3	B	Exception near Ahart, Being 2	Yankee Slough Bridges			Day Labor		15 ft. Concrete Base					
[illegible]	344	VII	Riverside	26	F	N.W.Cor.Sec. 20,T.6S.R.6 E	N.E.Cor.Sec.6,T.7S.R.8E	3.00		Day Labor		15 ft. Concrete Base					
[illegible]	51	V	San Benito	2	A	Station 0+00	Station 2[illegible]+00	4.40	9-26-17	Day Labor		Oil Surfacing	121		121		121
[illegible]	46	VII	San Bernardino	9	C	Lytle Creek Bridge		0.07	9-19-17	Day Labor	W. F. Bixby	Concrete Bridge	2,159	1,029	3,188	250	3,438
[illegible]	342	"	"	9	D	Through City of Upland		0.54		Day Labor		18 ft. Concrete Base	2,348	1,224	3,572	10	3,582
[illegible]	340	VII	San Diego	2	B	Through City of Oceanside		1.91	3-15-18	F. S. Grosnong	W. F. Bixby	15 ft. Concrete Base	5,397	3,703	9,100	288	9,388
[illegible]	47	"	"	2	C	Los Flores Creek Bridge				Day Labor		Grading	432		432		432
[illegible]	331	"	"	12	A	Through East San Diego & La Mesa		4.15	1-24-18	David H. Ryan	C. G. Kolster	15 ft. Concrete Base	28,651	7,902	36,553	984	37,537
[illegible]	345	"	"	12	B	Through El Cajon		2.41	4-10-18	A.E.Hall & R.L.Baskerville	C. G. Kolster	15 ft. Concrete Base	13,264		13,264	387	13,651
[illegible]		"	"	12	C	Station 358	Station 398	3.18	3-9-17	Day Labor	J. S. Beckjord	Grading	22,342	4,149	26,491	212	26,703
[illegible]		"	"	12	C	Station 424+34.46	Station 763+56	3.36	1-17-18	Day Labor		Grading	14,891	1,127	16,018	392	16,410
[illegible]	296	"	"	12	D	Guatay Creek	Pine Valley	4.55	[illegible]-11-17	W. M. Ledbetter	C. P. Montgomery	Grading	31,753	3,038	34,791	1,555	36,346
[illegible]	330	"	"	12	D	[illegible] mi. East of Willows	Sweet Water River	3.74	3-15-18	Maurice Ryan	C. P. Montgomery	Grading	16,973	737	17,710	244	17,954
[illegible]	330	"	"	12	D	Guatay Creek	Pine Valley	2.36	[illegible]-25-18	Day Labor	J. S. Beckjord	Grading	23,252	2,759	26,011	828	26,839
[illegible]	330	"	"	12	D	Viejas Creek			10-2-17	Day Labor	W. D. Eaton	Grading	769	4	773	8	781
D-180	330	"	"	12	D	Station 40	Station 179	2.57	1-16-18	Day Labor		Grading	1,852	1,053	2,905	190	3,095
[illegible]		"	"	12	D	Sweet Water River Bridge			3-25-18	Day Labor		Grading	548		548		548
[illegible]		"	"	12	E	Station 176	Station 192+56	0.28		Day Labor		Grading					
[illegible]	56	V	San Luis Obispo	2	A	Paso Robles	Northerly Boundary	0.20	6-19-17	Day Labor	J. I. Boaz	15 ft. Concrete Base	2,316	918	3,236	19	3,255
[illegible]	[illegible]	"	"	2	B	Atascadero Creek	Paso Robles	0.71	6-19-17	Day Labor	J. I. Boaz	15 ft. Concrete Base	5,387	3,143	8,530	314	8,844
[illegible]		"	"	2	C	Santa Margarita	Atascadero Creek	0.13	6-19-17	Day Labor		15 ft. Concrete Base	2,270	414	2,684	23	2,707
D-159	[illegible]	"	"	2	E	Arroyo Grande	San Luis Obispo	0.17	6-19-17	Day Labor		15 ft. Concrete Base	582	471	1,053		1,053
[illegible]	[illegible]	"	"	2	F	Santa Maria River	Arroyo Grande	11.98	11-19-17	W. A. Dontanville	E. Evers	15 ft. Concrete Base	28,314	34,609	62,923	2,814	65,737
D-154	[illegible]	"	"	56	C	Station [illegible]			[illegible]-8-18	Day Labor		Test Borings					

UNCOMPLETED CONTRACTS—Concluded.

[illegible]o.	[illegible] No.	Div.	County	Rte.	Sec.	From	To	Length (Miles)	Contract Date	Contractor	Resident Engineer	Type of Work	Expenditures To June 30, 1918			Engineering during Construction	Total
													Work	Materials	Total		
[illegible]	[illegible]	V	Santa Barbara	2	C	Zaca Station	Los Alamos	8.75	6-6-17	W. A. Dontanville	E. Frere	15 ft. Concrete Base	43,286	51,183	94,469	5,730	100,199
D-[illegible]	[illegible]	V	. .	2	C-D	Gaviota	Los Alamos		5-19-17	Day Labor	J. I. Boaz	Construct Cattle Passes	1,135	314	1,449	4	1,453
D-[illegible]	[illegible]	V	. .	2	D	Zaca Canyon Bridges		0.[illegible]	2-16-17	Day Labor	J. I. Boaz	Grading	3,334	12	3,346	22	3,368
D-[illegible]	[illegible]	V	. .	2	D	Nojoqui Creek Bridge		0.[illegible]	6-1-17	Day Labor	J. I. Boaz	Grading	1,015		1,015	5	1,020
D-[illegible]	1[illegible]	V	. .	2	E	Gaviota Canon Bridges		0.14	4-4-17	Day Labor		Grading	2,726		2,726	174	2,900
D-[illegible]	1[illegible]	V	. .	2	E	Alcatraz	Las Cruces	0.45	6-19-17	Day Labor	J. I. Boaz	15 ft. Concrete Base	4,294	1,689	5,983	70	6,053
[illegible]	[illegible]	V	. .	2	F	El Capitan Creek	Alcatraz	9.[illegible]	6-9-17	Tryon & Brain	S. D. Cowden	15 ft. Concrete Base	9,569	15,829	25,398	855	26,253
229	115	V	. .	2	F	Arroyo Honda Bridge			9-10-18	W.M. Ledbetter & Co.	S. D. Cowden	Concrete Bridge					
D-[illegible]	[illegible]	V	. .	2	F	Canada del Refugio & Arroyo Honda Bridges			11-25-17	Day Labor		Test Borings	325		325		325
D-[illegible]	[illegible]	V	. .	2	F	Canada del Refugio Bridge				Day Labor		Concrete Bridge					
D-[illegible]	[illegible]	V	. .	2	F	Canada del Refugio & Arroyo Honda Bridges			12-21-18	Day Labor		Construct Detours					
[illegible]	[illegible]	V	. .	2	G	Elwood	El Capitan Creek	9.45	6-9-17	Tryon & Brain	S. D. Cowden	15 ft. Concrete Base	22,330	32,410	54,740	2,499	57,239
D-[illegible]	[illegible]	V	. .	2	G	Near Elwood		0.0[illegible]	6-19-17	Day Labor		15 ft. Concrete Base	62	88	150		150
D-[illegible]	[illegible]	V	. .	2	H	Rincon Creek	Carpinteria Creek	2.35	5-25-17	Day Labor	C. L. Cain	Oil Surfacing	1,236	155	1,391		1,391
D-[illegible]	1[illegible]	V	. .	2	I	Stony Creek	Glen Anne Canon Road	0.54	5-28-17	Day Labor	C. L. Cain	Oil Surfacing	530	119	649		649
D-133	1[illegible]	V	. .	2	J	Near Serena		0.69	5-25-17	Day Labor	C. L. Cain	Oil Surfacing	475	91	566		566
D-157	[illegible]	IV	Santa Clara	2	A	At Santa Clara		0.[illegible]	9-15-17	Day Labor		20 ft. Topeka on Concrete	6,111	4,176	10,287		10,287
D-[illegible]	[illegible]	IV	. .	2	B	[illegible]	Coyote	7.54	4-3-17	Day Labor		Widening Concrete Base	20,562	14,768	35,330		35,330
D-[illegible]	[illegible]	IV	. .	2	C	Pajaro River Bridge		0.[illegible]	9-15-17	Day Labor		15 ft. Bituminous Concrete	1,176	214	1,390		1,390
D-[illegible]	[illegible]	IV	. .	[illegible]	A	At Milpitas		0.45	9-15-17	Day Labor		18 ft. Concrete Base	3,383	3,096	6,479		6,479
D-[illegible]	[illegible]	IV	. .	5	E	Stevens Creek Road	The Alameda	1.69	5-25-17	Day Labor		18 ft. Topeka on Concrete	6,755	884	7,639		7,639
[illegible]	[illegible]	IV	Santa Cruz	[illegible]	A	3 mi. S. of Glenwood	Santa Cruz	6.73	5-15-18	Federal Const. Co	Leon L. Clarke	15 ft. Concrete Base		1,756	1,757	926	2,683
200		II	Shasta	3	A	Cottonwood Creek Bridge		0.11	8-28-17	Tieslau Bros.	E. O. Sullivan	Concrete Bridge	2,377	7,757	10,134	356	10,490
[illegible]	[illegible]	.	.	3	[illegible]	Redding	Baylis	10.[illegible]	9-11-17	Palmer & McBryde	J. N. Bidwell	Grading	47,405	8,362	55,767	7,184	62,951
[illegible]	[illegible]	.	.	3	[illegible]	Sulphur,Boulder,Churn,Salt,Mood & Spring Crs.Crs.Brs.			7-[illegible]-18	de Waard Bros.	C. S. Haig	Concrete Bridges					
[illegible]	[illegible]	.	.	3	C	Sacramento River	La Moine	13.31	8-2[illegible]-17	J. F. Fitzpatrick	S. W. Lowden	Grading	57,416	14,519	71,935	6,779	78,714
[illegible]	[illegible]	.	.	3	C	Slate & Cone, Creeks Bridges				de Waard Bros.	S. W. Lowden	Concrete Bridges					
[illegible]	[illegible]	.	.	3	D	Hazel Creek	Northerly Boundary	11.25	6-6-17	Conners,Green & Co.	E. J. Bassett	Grading	106,672	15,225	121,897	6,579	128,476
[illegible]	[illegible]	.	.	3	D	Castle,[illegible] & Flume Creeks Bridges		0.[illegible]	5-16-18	May & Soult	F. J. Bassett	Concrete Bridges					
D-[illegible]		III	Sierra	25	A	Westerly Boundary	Downieville		1-25-17	Day Labor	L. H. Taylor	Grading	43,173	2,728	45,901	2,529	48,430
[illegible]	[illegible]	II	Siskiyou	3	A	Dunsmuir	Southerly Boundary	1.52		Conners, Green & Co.	E. J. Bassett	Grading					
[illegible]	[illegible]	.	.	3	A	So. City Limits Dunsmuir	Southerly Boundary	0.[illegible]		Day Labor	Leigh Brown	Grading	6,737	905	7,642	747	8,389
D-[illegible]		.	.	3	B	Yreka & Greenhorn Cr. Bridges			10-2[illegible]-17	Day Labor		Grading	2,117	63	2,180	57	2,237
D-[illegible]	[illegible]4	.	.	3	C	Oregon Line	4½ mi. South	4.50	5-2-17	Day Labor	M. J. Tilley	Gravel Surface	34,645		34,646	916	35,562
D-[illegible]	[illegible]	III	Solano	7	[illegible]	Suisun Creek		0.07		Day Labor	C. V. James	Concrete Bridge	4,530	2,092	6,622	453	7,075
[illegible]	[illegible]	.	.	7	[illegible]	Batavia	Putah Creek	8.55	6-6-17	T. M. Olney	R. R. Hatchett	15 ft. Concrete Base	33,139	27,854	60,993	4,668	65,661
[illegible]	[illegible]	.	.	8	A	Westerly Boundary	Cordelia	3.4[illegible]	5-2[illegible]-17	Harlan & Harlan	C. M. Butts	15 ft. Concrete Base	18,249	9,070	27,319	2,703	30,022
D-[illegible]	[illegible]	.	.	8	A	Westerly Boundary	Cordelia	0.44	12-27-18	Day Labor		Guard Rail					
[illegible]	[illegible]	IV	Sonoma	1	C	Santa Rosa	Willow Brook	12.42	10-17-17	Municipal Imp. Co.	C. F. Price	15 ft. Concrete Base	7,947	18,655	26,602	1,532	28,134
D-112	[illegible]	.	.	8	A	Station 54+22	Station 394	6.[illegible]	9-9-16	Day Labor	C. C. Cottrell	Gravel Surface	3,276	3,740	7,016	127	7,143
D-123	[illegible]	.	.	8	A	Near Petaluma Creek			4-4-17	Day Labor	C. C. Cottrell	Grading	932		932		932
D-[illegible]	[illegible]	III	Stanislaus	4	A	At Turlock				Day Labor		15 ft. Concrete Base		216	216		215
[illegible]	[illegible]	.	.	13	A	At Riverbank		0.[illegible]	4-15-18	Alfred H. Vogt	J. A. McDavitt	Concrete Bridge	4,701	3,426	8,127	336	8,463
[illegible]	[illegible]	VI	Tulare	4	B	Tipton	Tulare	9.1[illegible]	7-2-17	T. E. Shafer	R. S. Badger	15 ft. Concrete Base	41,935	28,321	70,256	3,267	73,523
[illegible]	[illegible]	.	.	4	C	2 mi. W. Visalia	Tulare	9.1[illegible]	6-6-17	J. H. Shafer	A.F.Carlinghouse	15 ft. Concrete Base	40,005	40,566	80,571	4,218	84,789
D-[illegible]	[illegible]	.	.	4	E	Kings River Bridge			6-26-17	Day Labor		15 ft. Concrete Base	1,182	343	1,525	5	1,530
D-[illegible]	1[illegible]7	VII	Ventura	2	B	Calleguas Wash Bridge			11-17-17	Day Labor		15 ft. Concrete Base	2,855	729	3,584	10	3,594
D-147	[illegible]	III	Yolo	6	A	Davis Subway		0.[illegible]	7-9-17	Day Labor		Steel Bridge	14,954	5,454	20,408	[illegible]	[illegible]
D-[illegible]	[illegible]	.	.	6	A	Approach to Yolo Trestle		0.90	8-[illegible]-17	Day Labor	C. V. James	15 ft. Concrete Base	11,549	7,082	18,631	[illegible]	[illegible]
D-[illegible]	[illegible]	.	.	6	C	Approach to Yolo Trestle		1.15	6-5-17	Day Labor	C. V. James	15 ft. Concrete Base	13,103	7,899	21,002	[illegible]	[illegible]
[illegible]	[illegible]	.	.	7	C	Blacks	[illegible]	10.90	7-2-17	C.H. & A. W. Gorrill	M. T. Heaton	15 ft. Concrete Base	33,670	19,968	53,638	2,763	56,401
D-[illegible]	[illegible]	.	.	7	C	Blacks	[illegible]			Day Labor		15 ft. Concrete Base					
D-[illegible]		III	Yuba	3	A	Grasshopper Slough, Dry Creek & Best Slough Bridges				Day Labor		15 ft. Concrete Base					

SEVENTH BIENNIAL REPORT

OF THE

STATE FORESTER

OF THE

STATE OF CALIFORNIA

CALIFORNIA STATE PRINTING OFFICE
SACRAMENTO
1919

42662

CALIFORNIA STATE BOARD OF FORESTRY.

William D. Stephens	Governor
Frank C. Jordan	Secretary of State
U. S. Webb	Attorney General
G. Morris Homans	State Forester

OFFICE OF STATE FORESTER.

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J. Diehl Schoeller (1st Lieutenant, A. E. F.)	Assistant
Gerald M. Hunter (U. S. Army)	Assistant
Walter J. Moodey	Secretary
J. A. Harney	Clerk

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LETTER OF TRANSMITTAL.

State Forester's Office,
Sacramento, California, October 31, 1918.

His Excellency, William D. Stephens,
Governor of California.

Sir: I have the honor to present herewith a report entitled "Seventh Biennial Report of the State Forester of the State of California."

Very respectfully,

G. M. Homans,
State Forester.

Western Yellow Pine (Pinus ponderosa). This pine is one of California's greatest lumber producers and is marketed under the trade name of "California White Pine." Western Yellow Pine reaches its best development in the middle belt of the Sierras. (Forest Distribution in California, page 65.)

INTRODUCTION.

California makes no appropriation for controlling the many fires which annually destroy its grain, range and timber. The federal government maintains a system for the protection of its lands within the national forests in the state, but outside areas do not receive adequate protection since the state depends upon the efforts of voluntary firewardens who serve without pay. These men cannot be expected to fight fires outside of their immediate locality, and as a consequence there are large fires every summer in remote sections, which burn uncontrolled until they assume such serious proportions that hundreds of men are forced to fight them for their own protection.

The majority of fires can be controlled with the expenditure of little time and money if they are caught when they start. The season of fire hazard in California is from May 15 to October 15, as a general rule, and during this period at least six district rangers, paid by the state, should aid in the organization for fire protection and be constantly on the job even as they are in the national forests. A bill providing for the employment of such men and for the payment of fire fighters called out by authorized persons will be introduced in the legislature during its next session. It deserves the hearty support of all citizens who wish to see California take its place among well-protected states.

The planting of 2,000 or more miles of state highway with suitable trees is a worthy post-war activity, and one which would give work to many returning soldiers who will be in need of just such outside occupation. Such work will appeal to many of these soldiers who have seen what has been done along this line in Europe. The State Forester urges the establishment of a state nursery for the purpose of growing stock for planting the state highways and public roads of the state, and for the beautification of state parks and school grounds. The State Board of Forestry will introduce a bill in the coming legislature to provide for such a nursery. It will carry a provision for the purchase or lease of a tract of land suitable for nursery purposes, as well as for the construction of suitable buildings and the employment of a nurseryman.

The war has caused the old order of things to pass away, and a period of reconstruction is at hand. The State Board of Forestry will do its share, but that it may secure the best results it urges the passage of the legislation above indicated.

FIRE PROTECTION.

The Federal Food Control Bill provides, among other things, that necessaries of war shall be protected against destruction by fire or other means. It is held in this law that all foods and feeds suitable for human or animal consumption are necessaries of war, and although the war itself is now over, the demand for foods and feeds is greatly increased and the readjustment program of the Federal Food Administration calls for greater saving and protection than ever before. We have just passed through one of the driest seasons in the history of the state, and regrettable as it may be, without the necessary legislation or funds to properly aid the federal government in the prosecution of the war in respect to the protection of our grain, range and timber lands.

No good reasons can be given for our not being prepared in this respect, since this department has endeavored at each session of the legislature to secure a sound and reasonable law, accompanied by a suitable appropriation, to do just the things the government called upon us to do this year. Our efforts in the past were defeated because the people of the state were not alive to the necessity for adequate fire protection. Without further discussion, therefore, and since the problem needs no further argument, I shall recommend again that legislation be passed that will definitely authorize the State Board of Forestry to install and maintain a fire patrol system for the prevention and suppression of fires burning in inflammable vegetation outside of incorporated cities. This recommendation is intended to cover all fires burning in grain, range, brush and timber lands within the state.

A drive is already commenced by the government for the planting of nearly two hundred thousand additional acres of grain, and because of the tremenduous destruction by fire of grain this season, it seems only just that those who oppose action of this kind should be severely dealt with as intentionally interfering with our reconstruction activities. Knowing the fire hazard, it is absurd not to make adequate provision for the protection of our foods and feeds.

Chief among the preventative measures necessary for the protection of our grain is the enactment of a law compelling every harvester within the state to be equipped with an effective spark arrester during the dry season, and to carry at least two fire extinguishers of any make approved by the Board of Underwriters' laboratories. This one law, if strictly enforced, will prevent much of such damage as was sustained this season.

The second provision necessary is that the refuse resulting from logging and split stuff operations shall be disposed of by burning during the season of the year when such can be done without danger to the adjacent territory. No burning, including the clearing of land, should be permitted during the dry season except by permit from the State Forester. The most destructive fire this year was the result of such carelessness, and destroyed approximately a million dollars worth of property in southern Humboldt and northern Mendocino counties. It should be a misdemeanor for a violation of these two sections.

That such legislation is necessary may be seen from a consideration of the following facts:

1. In 1918 there were 1,546 forest, brush, grass and grain fires in California, which burned over 333,000 acres and destroyed timber, foods, feeds and improvements valued at $1,593,758.
2 Data obtained from twelve insurance companies of the state shows for the period of 1915–17, inclusive, a total of 260 fires in grain and hay, occurring in thirty counties. The average annual loss per county, based on these figures, is $4,376, and the estimated annual loss for the state $225,000.
3. Over 1,000 preventable fires, occurring in the national forests of California during 1917, destroyed over $150,000 worth of property, and cost better than $84,000 to extinguish. These fires resulted in the withdrawal from productive work of the equivalent of 400 men working eight hours each day for four months.

This fall the greatest conflagration in history took place in the forests of northern Minnesota. It cost five hundred lives and destroyed property valued at $20,000,000. Condemning the parsimony of the legislative body in Minnesota the Minneapolis *Journal* says editorially:

> "The terrible harvest of this legislative parsimony has now been reaped in the fire stricken sections. A thousand useful lives have been wiped out under appalling conditions. The state of Minnesota saved a few thousand dollars, and now loses perhaps as many millions. And the property losses fall, not on the railroads and the lumber companies, but on the cities and villages, and heaviest of all on the poor settlers through this region. The merchantable timber has mostly been cut from these devastated lands, which were covered with dry brush, slashings and other inflammable material. The Forest Service, crippled fatally by legislative hostility, has been unable to detect and stamp out fires as quickly as they break out.
>
> "The state of Minnesota and its citizens will now spend many thousands of dollars for relief of the fire sufferers. The state will lose, too, the taxes on the property that has been burned up, and the products of the industries and the farms that have been wiped out.
>
> "Is it necessary for our legislatures to learn wisdom at the expense of such torture to human beings and such tremendous property loss? Will the coming legislature provide adequate protection for the life and property in other regions of the North Country now untouched, but quite as liable to disaster?"

Such fires are due to one of three things: Lack of preventative measures against outbreak of fire from well-known accidental causes; lack of vigilance in putting out a fire in its inception, or to a carefully-executed criminal scheme to destroy a vast amount of valuable property. In all three respects the duty of the state is inescapable. The fire records of California indicate that this state is not doing its duty in respect to fire protection.

FIRE REPORT FOR 1918. (Incomplete.)

Table Showing Number of Fires by Causes in 1918.

Location	Railroads	Lightning	Incendiary	Brush burning	Campers	Lumbering	Tractors	Unknown	Miscellaneous	Totals
Inside National Forests	12	603	73	25	199	23	------	94	85	1,114
Outside National Forests	15	10	14	33	51	------	97	136	76	432
Totals	27	613	87	58	250	23	97	230	161	1,546

Table Showing Area Burned Over in 1918.

Location	Area burned over, acres				
	Timber	Brush	Grass	Grain	Total
Inside National Forests	97,064	117,079	*	----------	214,143
Outside National Forests	59,052	25,031	28,326	6,513	118,922
Totals	156,116	142,110	28,326	6,513	333,065

*Forest Service groups brush and grass, so brush total is excessive.

Table Showing Money Loss by Forest and Grain Fires, 1918.

Location	Amount of damage			
	Timber and range	Grain and hay	Improvements	Total
Inside National Forests	$96,156 00	------------	------------	$96,156 00
Outside National Forests	1,126,265 00	$268,322 00	$103,015 00	1,497,602 00
Totals	$1,222,421 00	$268,322 00	$103,015 00	$1,593,758 00

Cost of Fighting Fires.

U. S. Forest Service in National Forests	$121,494 88
State Board of Forestry outside National Forests	*334 04
Total	$121,828 92

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*See County Protective Activities, p. 28.

Fire Data for 1918 (Outside National Forests).

County	Number of fires	Area burned over					Money damage			
		Timber acres	Brush acres	Grass acres	Grain acres	Total acreage	Timber and range	Grain	Improvements	Total
Alameda	7	------	------	780	57	837	------	$2,475	------	$2,475
Alpine	1	80	------	------	------	80	------	------	------	------
Amador	5	------	3,660	3,765	------	7,425	$200	------	$500	700
Butte	18	160	1,240	2,845	220	4,465	200	10,200	240	10,640
Calaveras	3	------	4	------	2	6	------	90	------	90
Colusa	7	------	100	4,040	42	4,182	400	2,550	7,500	10,450
Contra Costa	8	------	21	9	2	32	------	85	100	185
Del Norte	------	------	------	------	------	------	------	------	------	------
El Dorado	15	650	1,038	326	------	2,014	50	------	1,050	1,100
Fresno	14	------	204	38	283	525	------	14,260	8,275	22,535
Glenn	8	------	------	------	341	341	------	15,345	------	15,345
Humboldt	5	20,650	965	460	50	22,125	1,000,250	2,250	5,850	*1,008,350
Imperial	------	------	------	------	------	------	------	------	------	------
Inyo	------	------	------	------	------	------	------	------	------	------
Kern	3	------	------	------	233	233	------	10,500	------	10,500
Kings	4	------	------	------	40	40	------	2,100	11,000	13,100
Lake	------	------	------	------	------	------	------	------	------	------
Lassen	2	------	300	------	------	300	------	------	------	------
Los Angeles	4	------	615	4	------	619	------	------	10,000	10,000
Madera	1	------	------	------	100	100	------	4,500	------	4,500
Marin	40	2	525	200	------	727	205	------	7,550	7,755
Mariposa	2	------	1,000	------	------	1,000	------	------	------	------
Mendocino	7	25,200	2,700	2,600	200	30,700	31,200	9,000	------	40,200
Merced	22	------	------	367	1,340	1,707	95	34,750	------	34,845
Modoc	3	275	287	------	------	562	1,027	------	------	1,027
Mono	------	------	------	------	------	------	------	------	------	------
Monterey	1	------	300	------	------	300	------	------	------	------
Napa	23	------	215	92	25	332	------	1,000	4,900	5,900
Nevada	5	1	303	201	------	505	320	------	------	320
Orange	1	------	------	200	------	200	600	------	------	600
Placer	19	9,580	380	5,172	65	15,197	67,605	930	6,080	74,615
Plumas	1	------	40	------	------	40	------	------	------	------
Riverside	30	------	1,620	1,100	------	2,720	600	------	1,000	1,600
Sacramento	2	------	------	------	337	337	------	15,450	------	15,450
San Benito	------	------	------	------	------	------	------	------	------	------
San Bernardino	------	------	------	------	------	------	------	------	------	------
San Diego	8	------	1,070	------	------	1,070	------	------	------	------
San Francisco	1	50	50	------	------	100	------	------	------	------
San Joaquin	9	------	------	22	182	204	40	7,770	50	7,860
San Luis Obispo	1	------	2	------	------	2	------	------	------	------
San Mateo	7	97	2	11	7	117	500	1,000	1,250	2,750
Santa Barbara	2	------	------	60	10	70	------	450	------	450
Santa Clara	3	------	4	58	------	62	------	------	25	25
Santa Cruz	5	676	318	80	------	1,074	14,090	------	------	14,090
Shasta	6	20	165	300	146	631	550	5,000	------	5,550
Sierra	------	------	------	------	------	------	------	------	------	------
Siskiyou	2	175	575	------	------	750	100	------	------	100
Solano	3	------	------	2	52	54	------	2,245	------	2,245
Sonoma	16	310	2,290	381	------	2,981	900	------	------	900
Stanislaus	26	------	------	193	354	547	------	28,460	14,855	43,315
Sutter	11	------	------	------	612	612	------	27,725	------	27,725
Tehama	41	335	477	3,590	1,130	5,532	6,913	40,157	22,740	69,810
Trinity	1	700	1,040	------	------	1,740	------	------	------	------
Tulare	6	91	200	25	7	323	------	315	------	315
Tuolumne	4	------	3,320	1,000	------	4,320	------	------	50	50
Ventura	3	------	1	5	------	6	20	------	------	20
Yolo	14	------	------	400	634	1,034	400	27,825	------	28,225
Yuba	2	------	------	------	42	42	------	1,890	------	1,890
	432	59,052	25,031	28,326	6,513	118,922	$1,126,265	$268,322	$103,015	$1,497,602

*Includes fire damage in northern Mendocino County.

FIRE PROSECUTIONS.

The California state law relating to forest, brush, grass and grain fires defines the following offenses:

1. Setting fire, or causing fire to be set to inflammable vegetation growing on lands not his own without permission of the owner of such land. No person shall be convicted under this section who shall have set a back fire in good faith to check a fire already burning.

2. Allowing fires to escape from control or to spread to the lands of another person without using every reasonable precaution to prevent such escape.

3. Burning brush, etc., on his own land without taking every reasonable precaution to prevent the escape of fire.

4. Blasting with dynamite, etc., on forest or brush-covered land, either his own or the property of another, without taking every reasonable precaution to prevent escape.

5. Using any engine or boiler in or near any forest, brush, or grass land without adequate devices to prevent the escape of fire or sparks.

6. Refusing or failing to render assistance in combating fires at the summons of a fire warden, unless prevented by a good and sufficient reason.

7. Leaving a fire unextinguished and departing from camp, or allowing a camp fire to spread after building.

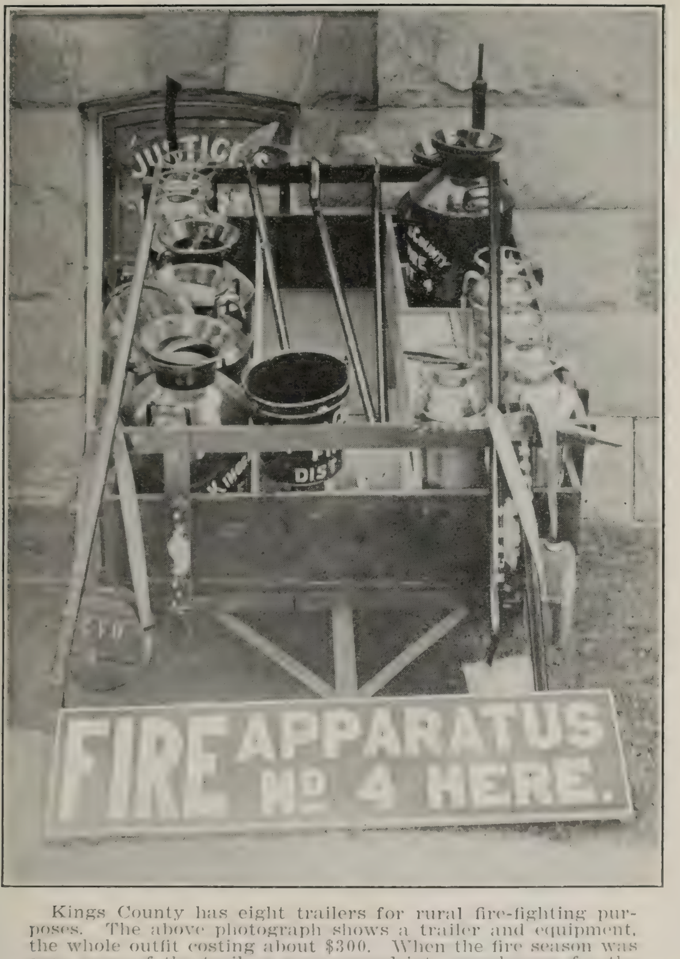
The following comparison of fire cases during the past three years indicates the trend of public opinion, since convictions are dependent upon the attitude of the public through their justices:

State Cases.

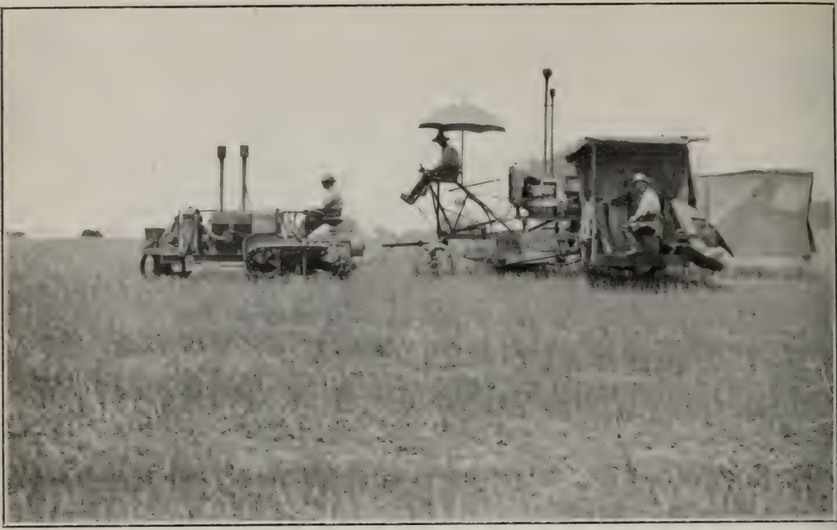
	Convicted	Acquitted	Total
1916	22		22
1917	17	5	22
1918	101	11	112

Federal Cases.

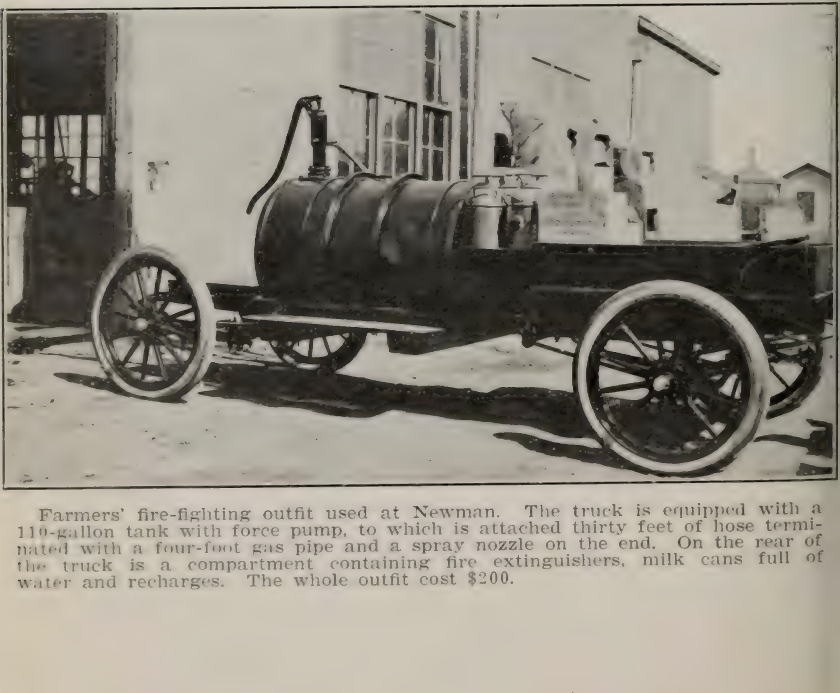
	Convicted	Acquitted	Total
1916	1		1
1917			
1918	10	8	13



Kings County has eight trailers for rural fire-fighting purposes. The above photograph shows a trailer and equipment, the whole outfit costing about $300. When the fire season was over some of the trailers were moved into warehouses for the protection of grain in storage.



Harvesting machinery is responsible for the majority of grain fires. Fires are set by hot carbon from the exhaust of tractors or auxiliary engines, hot boxes or ignition of straw in contact with exhaust pipes and manifolds. Suitable spark-arresters should be used, and fire extinguishers should form a part of every harvesting outfit.



Farmers' fire-fighting outfit used at Newman. The truck is equipped with a 110-gallon tank with force pump, to which is attached thirty feet of hose terminated with a four-foot gas pipe and a spray nozzle on the end. On the rear of the truck is a compartment containing fire extinguishers, milk cans full of water and recharges. The whole outfit cost $200.

By far the greater number of cases were brought by federal forest officers, some of whom gave their entire time to this work. Convictions were secured of all classes of people. Among those who were arrested and convicted for carelessness with fire was a doctor, a dentist, an attorney, a teacher in a public school, the chief of a state field party and a constable.

The penalty for wilfully or negligently committing any of the offenses above enumerated is punishable by law by a fine of not less than fifty nor more than five hundred dollars, or imprisonment in the county jail for not less than fifteen days nor more than six months, or both fine and imprisonment, except in the case of refusing or failing to render assistance in combating fires at the summons of a fire warden, in which case the fine imposed may be not less than ten dollars.

Decided efforts were made this year to apprehend offenders against the state and federal fire laws, and public sentiment favored the prosecution of offenders as never before. It was generally recognized that it was the duty of each loyal citizen to observe every precaution with fire, and that carelessness or willful disregard of the fire laws was equivalent to giving aid to the enemies of our country.

COUNTY FIRE PROTECTIVE ACTIVITIES.

On December 20, 1917, the Federal Food Administrator for California addressed the State Board of Forestry as follows:

> "State Board of Forestry,
> Sacramento, California.
>
> Gentlemen: The authority of the Food Administration under the terms of the Federal Control Bill covers the production and distribution of foodstuffs and food containers, and it has become very essential that we should conserve all of our resources.
>
> Therefore, I beg to ask that the State Board of Forestry should become associated with the Food Administration in this work and should assist us in the conservation of our cattle feed on the ranges and the lumber from which it is necessary to make both aeroplane material and box shook.
>
> Under the terms of the Federal Control Bill willful waste of food or feed or food containers becomes a crime. May we therefore ask that the State Board of Forestry will assist us in the protection of these important matters and report to us any cases which may appear to you to be a violation of the law?
>
> Very respectfully yours,
> Ralph P. Merritt."

As a result of this request the Forest Industries Committee of California, of which the State Forester is chairman and which includes representatives of the United States Forest Service, the University of California and the lumber industry, agreed to co-operate in awakening the various counties of the state to the need for some form of rural fire protection that would adequately meet the fire hazard.

It was decided that county organizations would be effective in dealing with the fire situation, and the boards of supervisors in practically every county in the state were asked to appropriate amounts not to exceed two cents per hundred dollars on the assessed valuation of the county for the prevention and suppression of fires. Authorization for making this appropriation from the general fund of the county is contained in subsection 40, section 4041 of the Political Code.

The State Forester, or his deputy or assistant, attended meetings in nearly every county of the state in the interest of county fire organization. The county farm bureaus, stockmen's associations, auto trades associations and the county councils of defense gave splendid co-operation, and about four hundred rural fire companies were formed and many fire wardens appointed. These county organizations did excellent work during the past season, promptly suppressing numerous fires which would otherwise have attained considerable size, thus preventing the fire losses for 1918 from reaching a figure far greater than that shown by our report.

Notwithstanding the organization of this county work, adequate fire protection has not yet been reached. The 1918 losses are shown as four times greater than those for 1917. This increase was due in part to the exceedingly long dry period, which greatly increased the fire hazard, and in part to the activities of the incendiary. A portion of this increase may also be accounted for by the fact that through our efforts this year the fire reports received by the State Forester have been more faithfully sent in and have been more complete.

Grain fires did tremendous damage this year, although special efforts were made for their suppression. From the reports received, and based upon the estimate of a prominent grain insurance adjuster, the loss of grain, hay, stubble and equipment was at least $300,000. The causes of the fires were investigated by an insurance company, and it was found that nearly seventy per cent were caused by sparks from tractors or auxiliary engines, and could have been largely prevented had suitable spark arresters been used.

Rural fire-fighting organizations demonstrated their worth this summer, but to be most effective their efforts should be co-ordinated under a general plan of fire protection for the state. Aside from the proposed district fire rangers to be provided by the state, agreements should be entered into with the several counties whereby they will bear their proportion of the burden of protection, and maintain, in at least the principal grain and range counties, one paid county firewarden, who shall be on the job during the dry season, devoting all of his time to the work, continuing the organization of rural fire companies and vigorously enforcing all state laws and county ordinances.

When we consider the need for food conservation, no excuse should be accepted for the careless use of fire which may destroy those things which are most necessary. The public should insist that the sheriffs' offices look upon the starting of fires in the same light as a man committing murder, and use their offices to the utmost in making this sort of thing unpleasant.

The protective work done by county organizations the past season is as follows:

Alameda County.

The Board of Supervisors appropriated $2,750 for five riders who are employed by the county for four or five months during the dry season of the year. The Stockmen's Protective Association of Livermore selects the patrolmen, who cover an area of 250,000 acres of range and grain lands. During the last twelve years this association has spent $6,000 for telephone lines and other protective measures, and at least 500 fires have been extinguished by the patrolmen in that period. The organization includes large and small landowners alike, with a nominal membership fee. All but 5,000 acres of government land are assessed.

This year there were 780 acres of grass land and 57 acres of grain burned. Several grass fires, each burning less than five acres, were extinguished by patrolmen and interested citizens. When the stockmen's association was first organized thirteen years ago, about one-half of its range lands were burned over each year, but by use of patrolmen, telephones and lookout men, fires are now controlled with little loss. No member of the association or its employees accept pay for fighting fires. The county paid about $100 this year for transportation and wages of fire fighters brought in from the outside.

Amador County.

The Board of Supervisors recommended a list of public-spirited citizens throughout the county for appointment as firewardens, and agreed to pay all incidental expenses that might be incurred by the wardens in handling such fires as might occur.

The most serious fire reported in this county burned over 7,000 acres of grazing land near Volcano, causing a damage of about $500.

Fewer fires than usual were set this season by hunters, due to the action of the county clerk, who issued licenses with the understanding that hunters leave matches and tobacco at home, and a notice to this effect was inserted in all the county papers.

Butte County.

The County Surveyor was authorized by the Board of Supervisors to distribute twenty-four auto trailers, with two fire extinguishers each, for valley fires, and 12 ten-men equipments for fire in the foothills and mountains. This equipment was to be placed in charge of the captains of fire-fighting companies.

That the county organization was not sufficiently strong to cope with the fire situation is shown by the following fires which burned in the county:

Post office	Ranch	Acreage burned over	Damage
Chico	Keefer	30 acres barley	$1,350
Gridley	Thresher	50 acres wheat and barley	2,250
Chico	Phelan	40 acres barley and oats	1,800
Durham	C. B. Wingate	10 acres barley	450
Durham	J. E. Rodley	20 acres barley	900
Chico	Harry Fraser	10 acres barley	450
Chico	Parrot	60 acres wheat	3,000
	Total	220 acres	$10,200

A forest fire which started from burning brush on the ranch of J. N. Bills, at Paradise, destroyed two carloads of wood before it was gotten under control. Fires of incendiary origin raged in the vicinity of Cohasset for several weeks this summer, burning over 16,000 acres of range and timberland.

Calaveras County.

At the recommendation of the County Council of Defense voluntary fire wardens were appointed in the various voting precincts. It is reported that there were less forest and grass fires in Calaveras County this summer than usual.

Colusa County.

Fire chiefs were selected in thirteen communities to organize the citizens to fight grain fires. The county made no appropriation for equipment, each town using what it had on hand.

At Arbuckle, a chemical engine which was purchased by popular subscription was used. When a grain fire was reported, the fire chief went out in advance to map out a plan of attack. Immediately following him came the engine with three men. Following the engine were two trucks, each with two 50-gallon barrels of water. Every member of the fire department was requested to respond to every alarm under penalty of a fine. The system at Williams was to take out fire extinguishers which had been collected and stored at the fire house.

Fires in Colusa County this summer destroyed grain and property to the value of at least $10,000. Near Sycamore, sparks from a tractor caused the destruction of twenty acres of standing barley and 170 sacks of harvested barley on the George Burke ranch. G. S. Gibson of Williams lost a harvester valued at $7,000 while harvesting grain. A range fire in the foothills, twelve miles west of Maxwell, burned over 4,000 acres of feed and destroyed ten acres of grain.

Contra Costa County.

The Board of Supervisors appropriated $2,500 for the purchase of trailers and equipment for twelve rural fire-fighting companies organized by the farm adviser. A county fire warden was selected through whom all reports on fires are submitted by the captains of the various fire companies to the State Forester.

A short time after the Danville rural fire company received its equipment, a fire started in the stubble back of the Alamo schoolhouse and threatened to burn the shed back of the school and to spread to a near-by barn and a stack of hay. The Danville outfit made the three-mile run within ten minutes after the alarm came in and the fire was soon put out by the use of fire charges.

El Dorado County.

Thirteen rural fire fighting companies were organized in this county through the efforts of the farm adviser and forest supervisor who worked in conjunction. No appropriation was made by the county for equipment, it being furnished by the United States Forest Service and interested persons.

The rural organizations did excellent work in keeping down fires. In former years the El Dorado National Forest officers fought many fires which threatened to cross its boundaries. These fires were controlled this year with little damage by the rural organizations.

One of the most severe fires in this county was on August 24. It destroyed a farm house and barn, and swept about 800 acres of grazing land. The fire was started by a group of small boys playing with matches.

Fresno County.

The protective system in Fresno County is based on the employment of five paid riders during the period of fire damage. Three men are paid $5 per day and are required to give their entire time to the prevention and suppression of fires. They are under the general supervision of the farm adviser, to whom they submit their reports. In addition to the riders, twenty-one rural fire companies were formed. Four hundred dollars' worth of equipment, such as axes, shovels, hoes, rakes and forks, have been furnished these companies by the county, and much has been supplied by the local residents.

The superintendent of a land company with holdings of 72,000 acres, constructed a trailer which he equipped with fire extinguishers for the better protection of the property over which he had supervision. He installed this equipment after a fire started from harvesters had burned 80 acres of wheat valued at $4,000. It was finally stopped in the face of a heavy wind by plowing furrows and by the use of wet sacks.

Fire of unknown origin destroyed a combined harvester valued at $4,575 near Coalinga. A fire at Wheatville, which started from a spark from a caterpillar, burned 100 sacks of threshed barley.

Glenn County.

The program for fire protection in Glenn County was worked out by the County Council of Defense and the Farm Bureau, and was one of the first to be put into execution. An ordinance was passed by the Board of Supervisors early in May this year requiring the plowing of firebreaks or the clearing away of inflammable material on highways adjacent to grain fields, the use of effective spark arresters on gas tractors, and fire extinguishers on combined harvesters.

For the suppression of fire seventeen rural fire companies were organized by the farm adviser and these were furnished trailers equipped with fire extinguishers, rakes, shovels, wire brooms, hoes, water cans, water bags, sacks and a 31-gallon barrel for holding water. Funds for this purpose were furnished by the county, there being no limit set to the amount to be spent to protect the grain fields against fire in an adequate manner. Posters were placed about the county asking that every possible precaution be taken with fire. Some of the most effective posters were as follows:

WARNING!
Grain and Range Fires
destroy needed food. Do
not take any risks which
may cause a fire.
County Board of Supervisors.

WARNING!
Do not throw lighted
cigars, cigarettes or matches
on the road or highways.
Keep auto cut-outs closed.
County Board of Supervisors.

WARNING!
Inform yourself about
the Glenn County Fire
Ordinance.
County Board of Supervisors.

That there was urgent need for a county fire fighting organization and that every precaution was necessary is shown by the following newspaper item:

> "MONROEVILLE (Glenn Co.), June 29.—The great barn of the Superior Farm Lands Company was destroyed by a fire, which Superintendent Morris Fetzer believes to have been of incendiary origin. The fire broke out at midnight.
>
> "Eighteen head of horses were cremated, seventy-five tons of hay and one hundred and seventy-five bags of barley burned and twenty sets of harness destroyed.
>
> "The fire was similar in many of its attending circumstances to the one at the Mills Orchard Company's farm at Hamilton City, one night recently, when twenty-three head of horses and mules were cremated."

A grain fire near Hamilton City which is believed to have been started by sparks from a harvester destroyed 150 acres of grain with an approximate loss of $15,000. Near Orland a fire started on the Hall ranch and destroyed 150 sacks of grain, four acres of standing grain and swept over several thousand acres of pasture land before it was brought under control. The fire was caused by a spark resulting from the wheel of a tractor striking a stone. Early in June lightning caused five grain fires in one day, one fire burning 50 acres of barley valued at $2,500 on the Wilson ranch near Germantown. Lightning struck in a grainfield near Orland, desroying 80 acres of barley. A defective spark arrester caused a fire on the C. E. Ellis ranch at Bayliss which burned 40 acres of grain.

Humboldt County.

Early in the season efforts were made by a member of the State Forester's office to organize rural fire-fighting companies in Humboldt County. Little response to his efforts was secured, since there was a strong sentiment in many places in favor of burning slash and brush in the summer. It was often stated that the country should be burned over every three years, and that while timber owners might groan about losses, only hollow and rotten trees would be destroyed.

In the latter part of August forest fires of unprecedented extent swept southern Humboldt and northern Mendocino counties, destroying the timber on approximately thirty square miles and the homes of several ranchers. Damage to the extent of at least a million dollars was done, since it is estimated that at least 20,000 board feet of timber per acre was destroyed. Trees could be heard falling from one end of the fire to the other, many of them redwoods and Douglas firs four feet in diameter.

There were three main fires which started in widely varying locations, and which swept furiously through the debris resulting from tanbark operations. Hundreds of men turned out to protect the ranches and towns in the path of the flames. County officials became alarmed, and called upon the State Forester for assistance, and a member of the office was sent to organize fire protection. At his request the Board of Supervisors of Humboldt County appointed a firewarden and authorized him to spend funds to hold the fire. A fire fighting force was organized and the fire was gotten under control, but not until it demonstrated to Humboldt and Mendocino county citizens that great damage can be done even in a redwood country, and that the allowing of fire to spread during the dry months is attended with great risks.

An interesting commentary on such fires was given in a local paper:

> "ORLEANS, Sept. 11.—The recent forest fires added the final touch of tragedy to the recent history of Mrs. Phebe Maddux, a poor Indian widow living near Somes Bar, in the destruction of not only her home but also her little garden, which supplied her with most of her living. Mrs. Maddux's son, a registrant in the June, 1918, class has but recently been ordered to Camp Lewis, leaving her almost entirely on her own resources. Her daughter, who has been attending the Indian school at Phoenix, Arizona, has been very ill and has just been returned to her home from the school hospital. She, too, must be cared for.
>
> "The fire raging on the mountain above the lonely home last week, swept down the mountain side with such fierceness that it swept the Salmon River. Here it burned over the entire holdings of the widow, destroying her house, barn and garden, and left her almost destitute.
>
> "Kindly neighbors are making an effort to secure funds with which to buy a cabin situated nearby and move it onto her little plot of ground, so that she may start a new little home for herself and daughter, and keep a welcome awaiting her soldier boy whenever he may return."

Imperial County.

The Board of Supervisors in session on June 17, 1918, passed the following resolution regarding protection against fire in rural districts:

> "WHEREAS, It appearing to this board that it is a matter of great importance that provision be made for protection against fire in the rural districts of Imperial County;
>
> "*Therefore, be it resolved,* That the Board of Supervisors of Imperial County, California, furnish to each farm center in Imperial County, a trailer for automobile, equipped with chemical tanks, to be used for fighting fire, upon the organization of a fire fighting company in said farm center;
>
> "*Further resolved,* That the cost of such trailer and equipment will not exceed the sum of $250, and provided that all subsequent expense be paid by the farm center; and
>
> "*Be it further resolved,* That each farm center be notified of the passage of this resolution."

No rural fire fighting companies were formed and no requests were made for equipment.

Kern County.

No rural fire-fighting companies have been organized in Kern County, and no appropriation has been made for equipment. On some of the large cattle ranches equipment is on hand for fighting range fires, but much of the county and especially the grain areas have not received ample protection.

The need for a fire-fighting organization in Kern County was demonstrated by several destructive fires which took place this summer. John Nole of Wasco lost his entire grain crop and one cutting of alfalfa. Mrs. Eberly of Panama lost $1,500 worth of hay, a wagon and a baler. Nine haystacks, aggregating 250 tons of hay, valued at $7,500, were destroyed by fire on the ranches of the Kern County Land Company and Philo S. Jewett, near Bakersfield. This fire, as well as a fire which destroyed fifty tons of alfalfa and barley hay on the H. S. Knight ranch, were of suspected incendiary origin.

Kings County.

A million bushels of wheat were harvested in the Tulare Lake region this year. Plans for its protection were made in the county through the organization of eight fire companies, an appropriation of $3,500 for the purchase of equipment, the passage of an ordinance requiring the safeguarding of gasoline engines in harvest fields, and the appointment of the County Sealer of Weights and Measures as county firewarden. As a consequence there was only a small loss of grain, whereas, the damage might have been very large had there not been a concerted action for preventing and suppressing fires.

The eight trailers were bought and equipped for about $2,400. The equipment of each trailer consists of eight chemical fire extinguishers, five 10-gallon milk cans, two galvanized iron buckets, three canteens, three sharp-nose shovels, two square-nose shovels, one pick, one axe, one pair wire cutters, one box sacks, twenty recharges, one back-fire torch 30 inches long made from 1½-inch gas pipe reduced to ⅜-inch nipple for wick, and having the capacity of one quart of gasoline. Each trailer was painted red and the number of the fire district stenciled in white letters. During the harvest season the trailers were placed on ranches in the wheat section.

The ordinance providing for protection against fire requires that harvesters shall have at least three suitable chemical fire extinguishers of not less than two and one-half gallon capacity, and that every gas tractor or engine shall have a suitable device attached to the exhaust for the purpose of arresting burning carbon. The county firewarden was diligent in seeing that the terms of the ordinance were complied with.

Fires in Kings County the latter part of July indicated incendiarism. Within a few days fires destroyed between 300 and 400 tons of hay, a large barn and refrigerating plant on the Los Posos ranch near Corcoran, causing a loss of $6,000, and thirteen tons of hay on the Workmen ranch near the same place. Only one grain fire took place in the county, it destroying forty acres of barley, valued at $2,100.

Lake County.

The Board of Supervisors appointed a man in each supervisorial district to look after fires and agreed to pay on a per diem basis while actively engaged in the work. The sheriff made an announcement to this effect in the county papers and requested the co-operation of all citizens. As a result there were few fires in Lake County this year, and those that occurred were not allowed to burn uncontrolled.

Los Angeles County.

Los Angeles County appropriated $10,000 for use in the fiscal year 1918-1919 for the maintenance of roads, trails and firebreaks in the Angeles National Forest, the money to be spent by the supervisor of that forest. There is a county firewarden, who takes out men from the sheriff's office to fires outside of the national forest, and a protective association which provides for the protection of the Laurel Canyon district through assessments levied on property owners. Another association, the Arroyo Seco Canyon Protective Association, consists of government leaseholders in the Arroyo Seco Canyon.

Firewardens have been diligent in apprehending violators of the state fire laws. There have been about thirty convictions in the county this year for carelessness with fire. Most of the offenses consisted in leaving camp fires burning. In the majority of cases the careless campers were fined $50 by the justices of the peace before whom they were brought.

Late in October a fire which was started by a rancher burning brush in the Sherman foothills, near Hollywood, swept up Laurel, Ponet and South canyons, and was not halted until it had burned 1,000 acres of watershed, many cords of wood, and had destroyed the Lookout Mountain Inn and adjoining holdings, valued at $10,000. The lives of seven persons were endangered, one man having to be dragged from a room filled with flames. The destruction of the watershed cover probably means a serious loss with the first big rainstorm, since a washout appears certain on the Sunset Boulevard road to Beverly and the county road through Laurel Canyon.

Madera County.

Madera County had next to the largest grain area in the state, but did very little for its protection. There was no appropriation made by the county for fire-fighting equipment, and no rural fire-fighting companies were formed. At a meeting held in Madera to consider fire protection the use of a spray pump was advocated as an effective means of fighting grain fires. One of these pumps was loaned for that purpose, and the Chamber of Commerce had it installed on a truck with a 50-gallon barrel of water. It was so late in the season, however, before this apparatus was installed that there was no opportunity for testing its effectiveness.

The most destructive grain fire in the county took place at Chowchilla, where a large stack of grain ready for the binder and one hundred acres of standing grain were destroyed.

Marin County.

Organized fire protection in Marin County is chiefly confined to the Tamalpais Forest Fire District, which was created by an act of the legislature—effective July 27, 1917. The act providing for the district defines a region in the vicinity of Mt. Tamalpais, the inhabitants of which pay the expense of a protective organization. A board of trustees acts as a governing board which estimates the amount necessary to provide adequate fire protection for the fiscal year. The board of supervisors of the county makes a levy upon all of the taxable property within the district in accordance with the recommendations of the board of trustees in the same manner as the state and county taxes. This year a levy of ten cents on each one hundred dollars was made, the maximum amount allowed by the act, and the funds secured were spent by the board of trustees for patrolmen and the clearing and construction of trails within the district.

One of the largest fires in the county this summer was started by careless charcoal burners on the Bodkin ranch, at Ignacio. It burned over about four hundred acres in the Lucas Valley region, and is reported to have killed a number of deer and cattle. A report made by E. B. Gardner for the Tamalpais Forest Fire District gives a total of 28 fires extinguished by its patrolmen. Nearly all of these fires were started from camp fires left by careless campers.

Mendocino County.

Two voluntary fire companies were organized by the farm adviser. No appropriation was made by the Board of Supervisors, and no county firewarden was appointed, although numerous fires within the county this summer made it extremely desirable for such a man to be on the job. A forest fire near Willits burned for two weeks, destroying much valuable range and tanbark oak, and at times it was necessary to curtail logging and tanbark operations to fight fires which could have been easily handled had there been someone delegated by the county to look after them.

The Van Arsdale ranch burned over, and as a result the owner had to look elsewhere for pasturage for several thousand sheep and cattle he had on the range. Much stock had to be shipped by railroad to new pasturage, entailing a heavy expense on the owner.

A disastrous grain fire in the fields of the Round Valley Land Company, near Covelo, which spread to the adjoining property of D. J. Johnson, destroyed 200 acres of barley and hay. The fire was caused from the sparks from a hay-baler engine which was driving down the road. A defective screen in the smokestack allowed the sparks to escape.

Merced County.

Sixteen rural fire-fighting companies were organized by the farm adviser, and $300 was appropriated by the Board of Supervisors for equipment. The farmers in the vicinity of Gustine, aided by the town, purchased a Ford truck and equipped it with fire extinguishers. In the latter part of the season a motor reserve was formed at Merced, and five machines were enlisted to carry men and equipment to fires in the vicinity. Good work was done by the motor reserve on several fires.

Two farm centers in the county did not think it worth while to organize fire protection. The loss of grain in these two centers was $25,000, as compared to $8,000 in the sixteen centers that were organized. The greatest loss of grain was on the Wassum place, seven miles from Merced, where 600 acres of barley running twenty sacks to the acre and 300 acres of stubble burned, causing a loss of $21,500. The fire was started by the tractor after two rounds of the field had been made. A heavy wind was blowing and there was no equipment at the ranch house with which to plow furrows or fight the fire. The fire was finally stopped on a trail made by a tractor running ahead of the fire, dragging a harvester wheel.

A number of grain fires in the vicinity of Merced were fought during the summer by a fire-fighting squad of prisoners from the county jail in charge of the deputy sheriff, and their efforts saved a large amount of grain.

Farm Adviser Grass reports twenty-five grain fires in the county this summer. He was able to secure data on seventeen of them, as follows:

Post office	Ranch	Acreage burned over	Damage
Ryer	Jones	40 acres barley	$1,500
Lingard	Russell	100 acres barley	2,500
Atwater	Wassum	600 acres barley	21,500
Merced	Hind	300 acres stubble, 60 acres barley	1,000
Merced	Vaughn	35 acres wheat, 15 acres stubble	2,500
Ryer	Bailey	35 acres barley	500
Ryer	Johnson	40 acres barley	1,000
Montpelier	Perkins	30 acres wheat	1,200
Plainsburg	Kahl	2 acres wheat	60
Athlone	Clausen	2 acres wheat	50
Merced	Crocker-Huffman	10 acres pasture	30
Gustine	Worthington	¾ acre grain, hay	1,000
Merced	McMurray	½ acre grain	30
Ingomar	J. F. Snyder	6 acres stubble	30
Merced	Robinson Bros.	20 acres grass	25
Merced	Robinson Bros.	15 acres grass	10
Merced	McSwain	⅜ acre grain	20

A firewarden at Los Banos reported a grain fire near that place which destroyed 30 acres and 200 sacks of grain valued at $1,800. The grain and range acreage reported as having been burned in Merced County this summer is 1,340 acres, valued at $34,750.

A county ordinance was passed by the Board of Supervisors providing for suitable spark arresters on tractors, but it is evident from the number of fires which can be directly traced to harvesting machinery that the ordinance was not well enforced.

Monterey County.

The Board of Supervisors issued an order requiring that all road foremen and squirrel inspectors accept appointment as voluntary state firewardens. An appropriation of $1,000 was made for the construction of roads and trails within the Monterey National Forest.

Napa County.

The Chief of the Napa Fire Department was appointed County Firewarden and the county divided into twenty-three districts, each headed by a captain and assistant captain, who were appointed firewardens by the State Forester and deputy sheriffs by the sheriff. The captains formed rural fire companies in their respective districts, consisting of ten firemen who agreed to respond to all fire calls within their general vicinity.

Each company is provided with a trailer or light spring wagon, equipped with one barrel of 50-gallon capacity filled with water, 8 buckets, 3 shovels, 3 rakes, 3 brush axes, 24 gunny sacks, 1 10-gallon tin can to hold gunny sacks, 1 20-foot rope, 1 12-foot ladder, 6 ½-gallon canteens, and 5 3-gallon chemical fire extinguishers. The county appropriated $1,000 for the purchase of extinguishers. The balance of the equipment was secured through private subscriptions and donations.

The captains were instructed to drill their companies in fire fighting and to have their equipment in good working condition at all times. It is their duty to take charge of such fires as occur, investigate their causes, inspect all property in their districts with reference to fire risk, and to report all violations of the county ordinance regarding the plowing of furrows around grain fields, and the use of fire screens and chemical extinguishers on all gasoline engines used in harvesting grain in the county. Captains report all fires to the County Firewarden, who reports them to the State Forester.

Napa County, ten days after the call was made, organized for the protection of the resources of war. Much credit for this organization, which is one of the best in the state, is due the County Council of Defense and Farm Adviser Baade. The installation of the fire companies was marked with impressive ceremonies, at which the Judge of the Superior Court presided. The Governor of the state administered the oath of office to the firewardens chosen by the people of their respective districts.

The rural fire companies were instrumental in extinguishing over twenty grain, brush, house and barn fires this season, several of them originating under suspicious circumstances. The loss would have been very high had it not been for the excellent fire organization in the county.

Nevada County.

Under the direction of Forest Supervisor Bigelow and Farm Adviser Graser, sixteen rural fire-fighting companies were formed by the farm bureau. The Board of Supervisors agreed to help with funds if it was found necessary, but the rural organizations proved to be adequate to handle all fires. Every fire that was reported was handled immediately and was extinguished with the loss of a small acreage.

Each company chose a fire boss, whose duty it was to see that sufficient help turned out to fight fires and who took charge of all fires originating in his district. A dispatcher was also selected for each district. The duty of the dispatchers, who were often women, was to receive word concerning fires which might be discovered and to spread the news in the district.

Another feature of the organization was that whenever it became necessary for any farmer to burn off a piece of brush land, permission had to be received from the fire boss of his district. If conditions were right, the permission was granted and the fire boss saw that enough men turned out to guard the fire.

The largest fire in the county was on the Washington Ridge, where it threatened to destroy a large amount of cut wood. It was put out by local residents and volunteers from Nevada City under the leadership of the Supervisor of the Tahoe National Forest.

Orange County.

The Board of Supervisors of Orange County paid $150 towards the salary of one of the federal forest service lookouts in the Cleveland National Forest, and provided $1,000 for the construction of trails. A county fire and game warden was also appointed. The federal forest service secures co-operation from the Villa Park and El Modena Water companies, and with the Irvine, Moulton and O'Neill ranches. This fall an attempt was made to burn off the O'Neill pasture from Lucas Canyon to the sea, but a stiff fight by fire fighters prevented the fire from burning over more than 200 acres. The circumstances of the fire indicate it was set with malicious intent.

Placer County.

Forest fires destroyed at least $75,000 worth of property in Placer County this year. Had it not been for the employment of a paid county firewarden by the Board of Supervisors, and the organization of twenty-one fire-fighting companies through his efforts and those of Farm Adviser Amundsen, the loss would have been much greater. On several fires members of the State Forester's office rendered assistance, notably, a fire on Moody Ridge, which covered 3,000 acres and destroyed timber and range to the value of $60,000. The timely arrival of crews of men from Forest Hill and Auburn saved several summer resorts which were directly in the path of the flames. Assistance was also rendered on a fire above Colfax, which burned over an area of 9,000 acres.

The following extract from the report of County Firewarden Sprague shows the value of a competent man on the job:

> "CAPE HORN DISTRICT. August 29 to 31, five miles east of Colfax. Fire started at head of Long Ravine, presumably from Narrow Gauge Railroad. Started August 29 about 2.30 p.m. Under control August 31 at 1.30 p.m. Acres burned 2,500.

Damage.

16 poles, Sunset Telephone Co.	$750 00
2 miles poles, Postal Tel. Co.	2,000 00
9 poles, Pacific Gas & Elect. Co.	800 00
Range	300 00
Timber	3,000 00
	$6,850 00

> Number of men at fire, 40. This fire endangered the following property: Cape Horn schoolhouse and the homes of Schroeder, Jansen, Sears and Hayford. Through the splendid work of these men the fire was headed away from these places. They likewise saved a great deal of property for the telegraph, telephone and power companies.
>
> LINCOLN, August 30. Ranch of George L. Comstock. Acres burned, none. No damage. Fire caused by bull wheel on harvester picking up flint rock and dropping it into gears, which in turn ground up rock, causing many flint sparks to fly. Mr. Comstock smelled smoke and stopped the harvester to see what was the trouble. As he did so, fire broke out directly under the rear of the machine. He grabbed a 2½-gallon chemical tank, his sack-sewer the other and before the fire had done any damage it was out. Mr. Comstock is very enthusiastic over the chemical tanks and claims without doubt they saved the field of 300 acres of blue-stem wheat. The tank had been installed four days previous to the fire."

The saving of the wheat in the above instance paid the salary of the county firewarden several times over. He was active in seeing that all harvesters were properly equipped with spark arresters and chemical fire extinguishers, and doubtless prevented many grain fires in this way, as well as fires in the timber by warnings given to camping parties as to care with fire. Two convictions were secured in the county for failure to obey the summons of the county firewarden to fight fire.

The manner in which the state and county can co-operate in controlling large fires was well demonstrated in Placer County this summer, when the State Forester was called upon to take charge of a fire which had gotten beyond the control of the local fire fighters. On account of the extreme emergency the State Forester obtained special permission of the State Board of Control to spend funds for fire fighting from his support appropriation, contingent upon an equal amount being spent by Placer County. This proposition was agreed to by the county board of supervisors, after which the fire was taken in charge by members of the State Forester's office. Crews were brought in from the outside to relieve the exhausted local force, and the fire was put out at a cost of $648, one-half of which was borne by the county. The owners of the land on which the fire took place furnished food and equipment, and patrolled the fire after it was brought under control.

The State Forester can spend very little money in this way on account of his limited appropriation, but if given an adequate appropriation, which he will ask for from the coming legislature, he can make agreements with the various counties of the state for control of fires similar to that made this summer in Placer County.

Riverside County.

Riverside County appropriated $1,000 to be used in the employment of a county firewarden. He has co-operated with the supervisor of the Cleveland National Forest and the farm adviser in the organization of ten rural fire companies. Twenty-five fires were reported by the county firewarden this summer. Most of these fires covered only small grass and brush areas, although one fire burned barley and a harvester valued at $1,000. What is most serious are the following fires which are thought to have been of incendiary origin:

Locality	Character of fire	Value
Vale Ranch	Warehouse and 2,200 tons of barley hay	$44,000
Armada	Barn and contents	2,020
Snell Ranch	Barn and contents	3,800
Armada	Granary, oil station	900
	Total	$50,720

Sacramento County.

Five rural fire companies were formed and $700 spent by the county for equipment. Two days after a trailer equipped with fire extinguishers had been installed at Galt a fire broke out in a grain field a few miles from town. By the time the fire company reached the fire it had burned 250 acres of barley and was in the wheat field belonging to one of the county supervisors. There was a strong wind blowing and the flames were twenty feet high, but such was the work done by the extinguishers that the fire was put out after it had burned only five acres of wheat. A rural fire company fought a fire which burned over 87 acres, and destroyed grain valued at $4,000, three miles southwest of Elk Grove. Grain valued at $12,000 was saved by the prompt action of the organization.

San Bernardino County.

San Bernardino County appropriated $2,900 to be spent under the direction of the farm adviser and the supervisor of the Angeles National Forest. Up to the present time the farm adviser has spent $400 for four trailers and equipment, and has organized six rural fire companies.

San Benito County.

The Deputy Horticultural Commissioner was appointed county firewarden by the board of supervisors in August, and authorized to organize a county fire protective system. No appropriation was made, and there is no record of any fire-fighting companies having been organized by the deputies selected by the county firewarden.

San Diego County.

This county has ½ cent in its regular tax rate for fire protection, and for 1918 this produced $3,607.42. Should more than this amount be required, the deficiency is met by a transference of funds from the contingent fund. The board of supervisors divided the county into six districts for fire protection, and appointed a warden for each district. In addition the county bears a proportionate share of the expense of lookout men on the Cleveland National Forest, the supervisor of which has general charge of the fire-fighting organization within San Diego County, and is authorized to make expenditures of the funds available in the way he sees fit. This year he has expended $3,143 of the county appropriation for county firewarden salaries, lookout men and for fire suppression.

San Francisco County.

This county raises no grain, and the climatic conditions are such that there is generally little danger from forest fire to its small timbered area. Last summer, however, a blaze swept one hundred acres of trees and underbrush in Sutro Forest, which is planted chiefly to eucalyptus. The city firemen, unable to connect with any water source, climbed the hills and fought the flames by back-firing.

San Joaquin County.

Although San Joaquin County has a larger grain acreage than any county in the state, yet no funds were appropriated by the board of supervisors for its protection. Five of the farm centers organized through the efforts of the farm adviser, and two provided themselves with equipment by assessing the members at the rate of one cent per acre. A county fire ordinance was passed and enforced to some extent.

Destructive fires occurred in the county, some of them supposed to have been of incendiary origin. A large hay and cattle barn, a silo and a milking barn on the C. A. Kelly ranch, near Lodi, burned on August 26. Many tons of hay, several head of cattle, four head of mules and one or two head of horses were lost. In June 150 acres of barley on the ranch of A. L. Watson, west of Thornton, were burned over, and a barn and shed on the James Pearson place were also destroyed. The loss from this fire amounted to $6,000. In the Farmington region a fire destroyed 30 acres of wheat, valued at $1,000. In the latter part of September a hay warehouse at Manteca belonging to Ed Powers, was destroyed by fire, which was thought to have been of incendiary origin.

San Luis Obispo County.

At a meeting of the Board of Supervisors on July 1, 1918, the following resolution was adopted:

> "M. B. Pratt, Deputy State Forester, and J. R. Hall, Forest Supervisor of the Santa Barbara National Forest, having appeared before the board on July 1, and made due representation that this county is not adequately protected from danger to loss of property by reason of forest and field fires, and this board having duly considered the said matter and being of the opinion that some proper steps should be taken, it is therefore resolved that the supervisor of each supervisorial district of this county act as a fire chief in his respective district, and that each road overseer in each of the several road districts of the county be requested to act as a captain of his respective district, for the purpose of organizing fire fighters in said road districts, and in order that said road overseers may have and be vested with proper authority to organize fire fighters in each of said road districts, it is hereby requested that the State Forester appoint each road overseer in this county as a firewarden, who shall have power to draft and organize fire fighters when needed, and that the clerk of this board be directed to furnish the State Forester with the names of the several road overseers in the county."

As a result of this action, there were no fires of consequence in the county this year. San Luis Obispo County made an appropriation of $406.25 this year for the use of the forest service for road and rail construction within the national forest in the county.

San Mateo County.

The chief of the Redwood City fire department was appointed by the Board of Supervisors to devise a plan for fighting forest fires in the county. In accordance with his recommendations, tools were purchased and three paid wardens appointed to patrol the areas of greatest fire danger.

Many prominent people have places in San Mateo County which were endangered by forest fires, as is shown by the following article which appeared in the San Mateo *News*:

> "After fighting nearly all night to subdue a forest fire which started on the Charles Templeton Crocker place, on the Alpine road near La Honda, Monday, 150 Camp Fremont soldiers yesterday succeeded in getting the blaze under control and confined the burnt area to about fifty acres. A large amount of timber on the Mayor Rolph place and timberlands of F. C. Talbot, the lumber magnate, were destroyed."

Santa Barbara County.

The supervisor of the Santa Barbara National Forest succeeded in organizing fire-fighting companies in several portions of the county, chiefly in connection with the constabularies of various communities. In the region back of Santa Barbara three companies with two squads of eight men each agreed to report to fire calls. Six districts were formed in Goleta Valley and a leader selected for each one. Residents of the Los Alamos Valley, Foxen Canyon and Sisquoc River Valley petitioned the Board of Supervisors for $500 to pay a firewarden under the direction of the forest supervisor. An appropriation for this amount was granted, and the warden who is on the job has done considerable organization work as well as secured two convictions for leaving camp fires unextinguished.

The Montecito Fire Protective Association employs a year-long ranger and has formed six volunteer companies. The town was assessed for enough to secure a trailer equipped with fire extinguishers, and a board of commissioners was appointed to look after the protective system. Foremen of the large estates located at Montecito were appointed firewardens and delegated to take their employees to fires in their districts. The association was formed as a result of a forest fire last year which seriously threatened the town and adjoining valuable property. In the latter part of July of this year it demonstrated its efficiency by putting out a brush fire set by a cigarette carelessly thrown from the Sycamore Canyon road, and which seriously threatened the residence of Carl Stoddard.

Santa Clara County.

The Board of Supervisors stood ready to pay fire bills that might be incurred in fighting fires within the county, but no fires took place that were not easily put out by local residents. A great decrease in the number of fires resulted through the notices posted by the members of the stockmen's association forbidding hunting on their ranges during the dry season.

Santa Cruz County.

Under the leadership of the county firewarden, the county was divided into nine districts, each having a firewarden and a fire dispatcher. The firewardens took complete charge of fire-fighting operations, and the duty of the dispatcher was to detect fires and convey information regarding them to the headquarters for each company. Responses to fire calls were prompt, and no fires were allowed to burn uncontrolled. The largest fire lasted thirty-two hours, on account of the amount of slashings on logging operations.

The county firewarden was diligent in enforcing the county fire ordinances. One prohibited the starting of any brush fire in the county from April 1 to November 1, except with the special permit of the county warden. The other ordinance required all slash to be burned before April 1. Some slashings were not burned by this time, however, and owners of land having these slashings were warned by the firewarden that should a fire start on their holdings and spread to adjoining property because of the fire hazard existing, they would be held responsible for the damage that took place. This warning proved effective, and some lumber companies patrolled their holdings at their own expense.

Shasta County.

Eight rural fire-fighting companies were organized by the farm adviser, and a good start made for a more effective organization next year. Equipment such as sacks, rakes and hoes were furnished by the members of the various companies. The use of a tractor and plow was found very effective in fighting grain fires.

Several grain and pasture fires took place, all of them being caused by sparks from tractors. The locations of these fires and the damage caused were as follows:

Post office	Ranch	Acreage burned over	Damage
Anderson	Geo. Chase	26 acres barley	$500
Anderson	C. Treat	20 acres barley	200
Anderson	E. A. Schuler	100 acres pasture	100
Anderson	L. W. Nelson	200 acres pasture	200
Balls' Ferry	C. C. Moore	100 acres barley	4,000
		446 acres	$5,000

The fires started by tractors demonstrated the need for regulatory measures and means for enforcing them.

Solano County.

Last year the Board of Supervisors of Solano County appropriated sufficient funds to build and equip thirteen trailers for rural fire-fighting companies. This county was a pioneer in this regard, and its type of equipment has been adopted this year by many of the grain centers with good results.

This year Solano County made no appropriation for fire fighting, the upkeep of the equipment being borne by the farmers.

The most destructive grain fire this summer burned 45 acres of barley, valued at $2,025, on the Hind and Huck ranch near Elmira. Another fire destroyed seven acres of hay and barley to the value of $220. A fire was started at the Allendale fire station by a passing passenger train at a time when a hard north wind was blowing. The firewarden at the station put out the fire immediately with a fire extinguisher, thus preventing a fire that would have destroyed thousands of dollars worth of standing grain and farm buildings. Another fire was extinguished from this fire station when a group of farm buildings and much pasture and barley was saved.

Sonoma County.

In 1917 the money damage caused by forest fires in Sonoma County was $274,300. This year it will not exceed $800, the large decrease in the loss being due to organized county effort toward the prevention and suppression of fires.

A county firewarden was appointed who organized twenty-six rural companies and appointed chiefs and assistant chiefs, who were made state firewardens. The firewardens were authorized by the Board of Supervisors to employ all necessary help for the purpose of fighting any and all fires occurring in their territory. It was stipulated that no pay would be made for the first six hours of such employment, but if the fire-fighting service continued over six hours, that 35 cents per hour for each hour employed would be paid, and that where it was necessary that fire fighters travel long distances to and from fires, that the reasonable time of travel for such distance should be construed as fire fighting.

Stanislaus County.

In addition to the organization of twenty-seven rural fire companies by the farm adviser, motor reserve corps were organized in several towns in Stanislaus County by the Stanislaus Auto Trades Association to assist in saving the necessaries of war. The Modesto corps has thirty-two automobiles enrolled. When an alarm of ten blasts of the whistle at the fire house is given as a signal that an out-of-town fire has been reported, the members call for equipment such as fire extinguishers and sacks, and disregard all speed laws getting to the fire. A city ordinance gives the motor reserve corps machines the right of way when going to a fire, and provides a severe penalty for anyone attempting to obstruct their progress. Machines are dispatched in squads of four by the city fire chief until word of the control of the fire is received. The rural fire fighting companies in the vicinity of the fire are also on the job, and the combined forces of townsmen and farmers have saved much grain and property in the county.

Branches of the Stanislaus Motor Reserve Corps were organized in Newman, Ceres and Patterson. Fire extinguishers were furnished in some cases by the county, which appropriated $2,000 for their purchase, but in other cases farmers voluntarily assessed themselves on an acreage basis to provide the necessary equipment. In one town the merchants loaned extinguishers for the period of fire danger, and the fire truck was donated by a local garage man.

Stanislaus County had more than its share of rural fires this summer, and the loss, though about $44,000, would have been several times greater had it not been for the organized efforts of its citizens.

Twenty-six fires were fought from June 4 to July 8, and it is estimated that at least $70,000 worth of grain was saved in this period through the efforts of the motor reserve and the rural fire-fighting companies. The following list gives the larger grain and pasture fires fought:

Post office	Ranch	Acreage burned over	Damage
Modesto	L. C. Gates (2 fires)	22 acres barley	$1,450
Salida	Geo. Litt	35 acres barley	1,750
Modesto	G. C. Outland	10 acres barley	495
Modesto	J. H. Severin	20 acres barley	320
Hickman	N. E. Leek	Stack grain hay	1,855
Hickman	Chas. Crow	120 sacks barley	2,000
Modesto	Emil Marcher (2 fires)	7 acres barley	290
Montpelier	L. M. Hickman	95 acres barley-wheat	3,700
Hickman	Frank Wallace	150 acres barley	7,500
Modesto	A. D. Schmidt	1,000 sacks barley	2,500
Oakdale	Matthew Carrigin	500 sacks barley and harvester	4,000
Newman	Worthington	9 acres barley, hay	860
Newman	Stanley	Stack of hay	1,000
Newman	Kauffman	Stack of hay	800
	Total	348 acres grain 1,620 sacks grain. 4 stacks of hay.	$28,460

In adddition to the grain and hay fires given, several house and barn fires, which destroyed property valued at $15,000, were fought.

Sutter County.

Fire meetings were held in all the farm centers of the county, and the farm adviser obtained signed agreements from farmers who agreed to keep a fire extinguisher, three fire beaters made of sacks, two shovels, buckets and a ten-gallon can of water on their ranches in a place where they would be readily available in case of fire in the vicinity. No appropriation was made by the county to assist in fire protection, but a fire ordinance was passed with no means for its enforcement. Most of the fires were set from sparks from tractors.

The loss of grain in Sutter County was high, as is shown by the following fires which were reported:

Post office	Ranch	Acreage burned over	Damage
Meridian	Max Reischal-Wm. Summy	15 acres barley	$600
Live Oak	Onstott Estate	30 acres barley	1,350
Meridian	Birk Bros.	40 acres barley	1,600
Tudor	Grover Shannon	12 acres barley	550
Cranmore	A. T. Spencer Ranch Co.	40 acres wheat	2,000
O'Bannon Corner	George Bailey	350 acres barley, 100 sacks	16,000
Sutter City	A. E. Schellenger	30 acres barley	1,350
West Butte	Santee	25 acres barley	1,125
Cranmore	H. Poffenberger	25 acres barley	1,125
Sutter City	Mrs. Jennie Olsen	30 acres barley	1,350
Sutter City	DeWitt	15 acres barley	675
	Total	612 acres, 100 sacks	$27,725

It is very evident from the above record that grainfields were not adequately protected in this county, and that a more effective organization is necessary.

Tehama County.

The Board of Supervisors made an appropriation of $2,000 for fire protection purposes, and appointed a county firewarden, who organized fire companies at Red Bluff, Los Molinos, Corning, Tehama and Gerber. The fire-fighting equipment was not secured until late in the season, by which time several destructive fires had taken place. County Firewarden Mount reported the following fires for the season:

Post office	Ranch	Acreage burned over	Damage
Dairyville	Salsbury	31 acres barley	$1,200
Elder Creek	Somers & Co.	50 acres barley, 625 acres stubble, improvement	6,000
Kirkwood	Reid	33 acres barley, 150 acres stubble	2,232
Red Bluff	Galhain-Irish	150 acres pasture	75
Red Bluff	Sykes	10 tons hay, improvements	210
Alder Creek	Cousins	35 tons hay, improvements, 50 acres pasture	1,700
Kirkwood	Reid	350 acres barley	10,500
Red Bluff	Wilcox	250 acres pasture, fence	450
Corning	Stone	40 acres stubble	100
Vina	Godbolt Bros.	350 acres stubble, hay, grain and improvements	7,500
Corning	Beaumont	50 acres pasture	100
Kirkwood	Vote	130 acres pasture, hay, wood and buildings	5,000
Vina	Stanford	100 acres barley, 800 acres pasture, improvement	14,200
Tehama	Somers & Co.	50 acres stubble	100
Colyear Springs		500 acres range	500
Los Robles	Simonette Bros.	3 stacks barley	500
Paskenta	Uhl	500 acres barley	15,000
Corning	Stone	40 acres pasture, fence	100
Tadpole Springs		1,200 acres pasture	360
Orchard Park	Stice	16 stacks barley, improvements	2,890
	Chipman	10 acres barley	375
20 other fires burned		75 acres range, improvements	728
Total, 41 fires		1,130 acres grain, 4,400 acres stubble and range, improvement, including stacked hay and barley	$69,810

Three other fires were reported which are not included in the above list, since they were confined to ranch buildings. One fire, which destroyed a blacksmith's shop and its contents, started from a man smoking, and another which burned a cutting shed and fruit trays valued at $1,350 was started by a child playing with matches.

Tulare County.

The Board of Supervisors of Tulare County, acting on the recommendation of the Stockmen's Association and the Farm Bureau, appropriated enough funds to equip the twenty-one rural fire-fighting companies which had been organized by the farm adviser. Eleven trailers were purchased and equipped with the same kind of equipment as that used in Kings County, with the exception of the fire mops, which were devised locally. They are designed to hold wet sacks and have handles six feet long terminating in an iron two and one-half feet in length, so bent as to hold two sacks securely.

Besides the trailers which were designed for use on fires in the valley, nine sets of equipment for mountain use were secured. A set consists of four kyak cans for holding water, two round-pointed shovels, two canteens, four milk cans and four fire mops. Altogether about $3,500 was spent for equipment which paid for itself in one of the first fires fought. A fire broke out in a small town at a time when the water supply was shut off on account of a defective motor operating the pump. A trailer had been placed in the town a few days before, and the extinguishers were used to such good advantage that the fire was put out after doing little damage.

The only grain fire reported burned seven acres. There were a number of small fires at which the fire-fighting apparatus was used with good effect. It is estimated that about $7,275 worth of property was saved by the use of the fire-fighting equipment stationed in various sections of the county.

Tuolumne County.

The Board of Supervisors appointed Mr. G. W. Price, a public-spirited citizen of Sonora, as County Firewarden, at a salary of $1.00 per year, and authorized the expenditure of $500 for fire-fighting tools and fire notices to be posted throughout the county. The County Firewarden selected district firewardens, ten of whom organized rural fire-fighting companies.

No grain was destroyed during the summer, but over 4,000 acres of brush and grass land were burned, requiring the labor of forty men for three days to fight fire. Five Mexicans were arrested in June and jailed in Sacramento upon the charges of setting seven forest fires between Strawberry and Camp Lowell.

Ventura County.

The very destructive fire in Ojai Valley last year, which cost a number of lives and destroyed much property, led to a county fire-fighting organization this year. Farm Adviser Essig advocated the trailer system, and was authorized by the Board of Supervisors to purchase and equip six trailers. An appropriation of $2,200 was made for this purpose and to cover contingent expenses. A fire boss, an ex-forest ranger, was appointed, and six fire-fighting companies organized to work under his direction.

The Board of Supervisors also appropriated $700, the amount received by the county on account of revenues from the national forests, to be spent by the Supervisor of the Santa Barbara National Forest in trail work within the county.

Yolo County.

Twelve rural companies were organized in Yolo County by the farm adviser. Of these, seven have auto trailers and the others have necessary equipment with arrangements for hauling it to fires. The Board of Supervisors supplied equipment to the extent of $150 per unit.

Last year much grain was saved by the fire truck, which had its headquarters at Woodland, but it was found that the long distance traveled was not conducive to the best results. The fire truck was used this year supplemented by the trailers.

Fires in Yolo County this year destroyed grain and range valued at $25,000 or more. Some of the fires were evidently of incendiary origin, but the majority of them were set by sparks from tractors and combined harvesters. The following fires took place this season:

Post office	Ranch	Acreage burned over	Damage
Esparto	Mrs. J. E. Spaulding	25 acres barley	$1,125
Winters	J. G. Frederick	25 acres wheat	1,250
Winters	J. G. Frederick	140 acres wheat	6,300
Dunnigan	Fred Stopher	150 acres barley	6,750
Yolo	Richie	140 acres barley	6,300
Yolo	Farris	35 acres alfalfa seed and barley	1,575
Woodland	J. O. Chambers & Son	25 acres barley	1,125
Esparto	Moore & Gray	400 acres pasture	400
Knights Landing	Yolo Ranch Co.	10 acres wheat	500
Davis	Geo. A. Gordon	2 acres barley	125
Esparto	Smith	25 acres barley	435
Davis	Jack Cecil	22 acres barley	750
Woodland	Briscoe	15 acres barley	540
Woodland	French	20 acres barley	650
	Total	1,034 acres	$27,825

Yuba County.

The Board of Supervisors made an appropriation of $500 for equipment on the condition that a like amount be raised among the ranchers residing in the districts covered by this equipment. Five sets of equipment were procured through the farm bureau, and arrangements were made for a fire boss and two assistants in each district to look after it.

The County Surveyor was named to act as County Firewarden at a salary of $1.00 per year, together with his traveling expenses.

The most destructive grain fire in Yuba County was on the ranch of H. G. Morris, where 30 acres of standing barley were burned. Twelve acres of grain were burned on the Cohn place by a fire which started from the clearing of a railroad right of way.

Alpine, Del Norte, Lassen, Mariposa, Modoc, Mono, Plumas, Sierra, Siskiyou and Trinity Counties.

The above mentioned counties have large areas within national forests, and many of the citizens co-operate with the government to a more or less extent in the prevention and suppression of fires. There are considerable areas in each county, however, lying outside the national forests, in which local fire-fighting organizations should exist.

PROTECTIVE ASSOCIATIONS.

A systematic plan of co-operation between private, state and federal agencies is one of the fundamental aims of true forest protection. California has made little progress in this direction compared with what has been done in the other Pacific coast states, due to the failure of the state to authorize the employment of state rangers and the payment of fire-fighting bills. When California wakes up to the need of systematic fire protection and gives the State Board of Forestry authority to establish an adequate protective system, then the State Forester will be in a position to ask co-operation from the federal government, under the Weeks law, and stimulate the formation of private protective associations within the state.

There has been little increase in the number of protective associations in the state during the past few years. The work done by the few that are in existence is commendable, but their influence would be much more widely felt if they were made units of a state protective system such as is outlined in the bill which will be introduced by the State Board of Forestry in the coming session of the legislature.

Beside the Redwood Fire Protective Association and the Tamalpias Fire Association, the activities of which have been stated elsewhere, reports have been made by other associations as follows:

Arroyo Seco Canyon Protective Association.

Headquarters Security National Bank, Los Angeles, California.

The Arroyo Seco Canyon Protective Association was organized in 1912, and consists of about seventy-five members, all being government leaseholders in the Arroyo Seco Canyon.

The Arroyo Seco is the longest and one of the most beautiful canyons in southern California, and is a part of the Angeles National Forest. All of the members of the association take an active interest in watching and inspecting camp fires of all transients. All campers who desire to build fires in the canyon must first obtain a written permit from the Federal Forest Service. Mr. W. B. Marks is the ranger in charge. Due to these precautions, I am pleased to report that the Arroyo Seco Canyon has been entirely free from fire for a number of years.

O. L. Olshausen,
Secretary and Treasurer.

Laurel Canyon Protective Association.

Headquarters at Hollywood.

MR. G. M. HOMANS, *State Forester,*
Sacramento, California.

DEAR SIR: Replying to your recent favor for information regarding the Laurel Canyon Protective Association, will say that it was organized at a public open meeting, held October 29, 1917, notice of which meeting had been sent to all property owners as well as residents within a district comprising generally the Laurel Canyon watershed.

The purposes of the association are for protecting the district against fires both from within and without the district, through the construction of fire breaks along the rims and ridges of the mountains, by the placing of fire boxes containing tools and fire fighting apparatus at convenient intervals along the county roads, and for fighting fires along the most efficient lines possible when such fires occur.

A topographical map of the district was prepared and various places were selected for the preliminary construction of fire breaks, with the intention of adding to them each year as funds would permit. At the present time over one mile of fire break has been constructed, comprising ten different locations in the district, ranging in length from 200 to 1,000 feet, the purpose being to protect immediately so far as possible the homes in the district.

Five large tool boxes have been placed along the county roads, containing shovels and other fire-fighting tools. Eight voluntary firewardens have been appointed to take charge of the fire fighters, and occasional meetings are held by these wardens for general discussion of matters pertaining thereto. A red telephone card containing the names and telephone addresses of all the firewardens, both residence and business phones, as well as that of all the residents of Laurel Canyon, has been published and given to every householder in the district. Warning signs on cloth have been printed and posted conspicuously in various parts of the district.

The officers and directors of the association hold monthly meetings, and an annual meeting of the entire association is held in January of each year. The annual dues of members were fixed as follows: Tract owners, $25; house owners, $5; and lot owners, $2. The collections for the first year amounted to about $400, with only a comparatively small number of the property owners contributing. However, a large percentage of the actual residents of the district have contributed, the nonresident owner being very difficult to awaken to his responsibility.

There have been two fires in the district this year; one fire in the neighborhood of one of the houses was very quickly put out by reason of the immediate proximity of adequate fire-fighting equipment. On October 26 a very serious fire occurred, resulting in the burning of about 1000 acres of watershed and the destruction of the Lookout Mountain Inn and one or two small buildings.

The firewardens of this association took a very active part in handling this fire condition, and by reason of the equipment belonging to the organization and a certain degree of preparedness by reason of the experience of such an organization, the fire was handled much more efficiently than would otherwise have been the case.

The organization has believed that one of the best ways of fighting fires is to prevent their occurrence, and to that end is actively engaged in determining the cause of the recent fire, and if any criminal or civil responsibility attaches to the individual who caused it, the association intends to carry out the full legal remedy, not only in this case but in every other case. The association also is having an attorney make a search of the laws in order that the watersheds of the state outside the forest reserves may be protected against the carelessness or indifference of those who are responsible for the many fires which occur, in the belief that the criminal laws which cover the charge of arson could be properly made to cover the destruction of valuable trees and watersheds of the mountains as well as the danger to the lives and homes of those who have chosen to live among the mountains because of their love for that environment.

Very truly yours,

R. D. Vercler.

Portola Valley Association.

Headquarters Portola Valley, San Mateo County, California.

State Forester,
Sacramento, California.

Dear Sir: Our little fire protection district association is composed of nine property holders in the Portola Valley, San Mateo County, California. We subscribed $50 apiece as a nucleus of a fund to be used in fighting fires in our district. We purchased an auto trailer and stocked it with the necessary tools to equip twenty men on the fire lines. From my personal observation in handling fires in this district, I find the shovel and the "dago" hoe to be the most effective tools for the fighters, with the added equipment of a canteen of water strapped over the shoulders. We have been able to extinguish grass fires more effectively with brush cut in convenient lengths so the men can use it by whipping the fire rather than by beating it with wet sacks, as water is not always obtainable.

Of course the most important feature in connection with extinguishing a fire is to get there as quickly as possible, and this can best be brought about by quickly reporting the fire to our local headquarters. The money spent by a community in paying wages to a man who is constantly on the watch is therefore used to the best advantage. Our force consists of about twenty men who are working in the immediate neighborhood, and who have been selected because of their past experience in fighting brush fires. We guarantee the wages of these men and try to pay them promptly. We aim to work with the county officials and under the direction of their chief firewarden.

Very sincerely yours,

S. W. Morshead.

Stockmen's Protective Association.

Headquarters at Livermore, California.

1. An area of 250,000 acres is protected by our association. This territory is patrolled by a co-operative agreement between the association and the counties of Alameda and San Joaquin. All but 5,000 acres of government land are assessed. No patrolmen are employed by the association, but it nominates the patrolmen who are subsequently appointed by the counties.

2. Extra men are employed only in case of fire. So far the number of extra men varies from six to two hundred and fifty.

3. During the last twelve years the association has expended for protection, telephone lines and other protective work, approximately $6,000. In addition to this many hundreds of dollars have been spent for protection by individual members.

4. About five hundred fires have been extinguished by the association during the last ten years. Not more than a dozen were able to do much damage, and in recent years the fires have been reduced to a minimum.

5. One life has been lost.

6. About $20,000 has been lost through fire damage to houses, barns and other improved property since the organization started its work.

7. We have made no arrests, but have collected $40,000 in insurance and fire losses through influential committees.

8. Sufficient assistance is given by state, county and federal authorities and insurance companies, together with public opinion and the local press, to give us ample protection. We are following out a plan on these lines: An organization including large and small landowners alike, with a nominal membership fee. We have sufficient fire-fighting equipment to insure protection. The use of mountain telephone lines and automobiles partly owned by private individuals and corporations has been invaluable in attaining adequate protection.

We recommend co-operation with the Fish and Game Commission, reputable gun clubs, and the fish and game officers of the state and counties. We approve of co-operation between local fire-fighting associations, the boards of supervisors of counties and the State Forester, making the office of the State Forester a center bureau.

9. Our association recommends the most strict co-operation between federal, county and state authorities as well as with local associations. I would recommend a meeting of committees representing all parties in interest who look to the saving of our timber, our grass lands and improvements on farm and pasture lands. This is a serious matter and I am willing to do my bit for the conservation of property.

By JOHN J. CALLAGHAN,
Secretary, Stockmen's Protective Association,
of Alameda and San Joaquin Counties.

Fire Protection in the Redwoods.

In an effort to obtain the sentiment regarding fire protection and methods of control in the redwood region, the State Forester sent a questionnaire to all operators manufacturing redwood lumber or split stuff. Twenty-three replies were received to the questionnaire as follows:

1. Do you burn logged area before removing the logs? Yes, 19; no, 4.

2. At what season of the year is such burning usually done? Spring or fall, depending on weather, 10; summer, 6; fall after the rains, 4; no reply, 3.

3. How many acres of unburned slash have you? From logging operations, 21,090; from split stuff, 3,510.

4. Do you believe burning slash tends to relieve the fire hazard? Yes, 18; no, 3; no reply, 2.

5. Would you be willing to adopt such a policy to assist in the control of fires during the period of the war? Yes, 16; not helpful in all cases, 2; no, 1; no reply, 4.

6. Would the burning of slash from split stuff during the late fall, after the rains, be a means of fire prevention? Split stuff operators: yes, 17; no reply, 1.

7. Do you insist upon donkeys being screened during the dry season? Yes, 7; no, 11; no donkeys, 3; no reply, 2.

8. Would you be willing, during the period of the war, to voluntarily screen donkeys? Yes, 7; no, 6; if practicable screens could be made, 2; no reply, 5; no donkeys, 3.

9. What precautions are you taking to prevent fires on your property during the summer months? Notify crew foremen to watch out for fires and fight them if necessary, 11; maintain patrol and fire fighting equipment, 4; no precautions taken, 8.

10. How many fires occurred on your property during 1917? Twenty fires reported.

11. What was the approximate total acreage burned over? Ten firms reported 7,920 acres; 1 firm reported miles of forest; 12 firms reported no acreage.

12. What was the estimated total damage? Two firms reported $1,250 damage; 1 firm reported small indefinite damage; 13 firms reported no damage; 7 firms did not reply.

13. Are hunters and campers excluded during the dry season? Yes, 5; no, 18.

14. Did campers and hunters cause any fires on your property in 1917? Yes, 3; no, 17; no reply, 3.

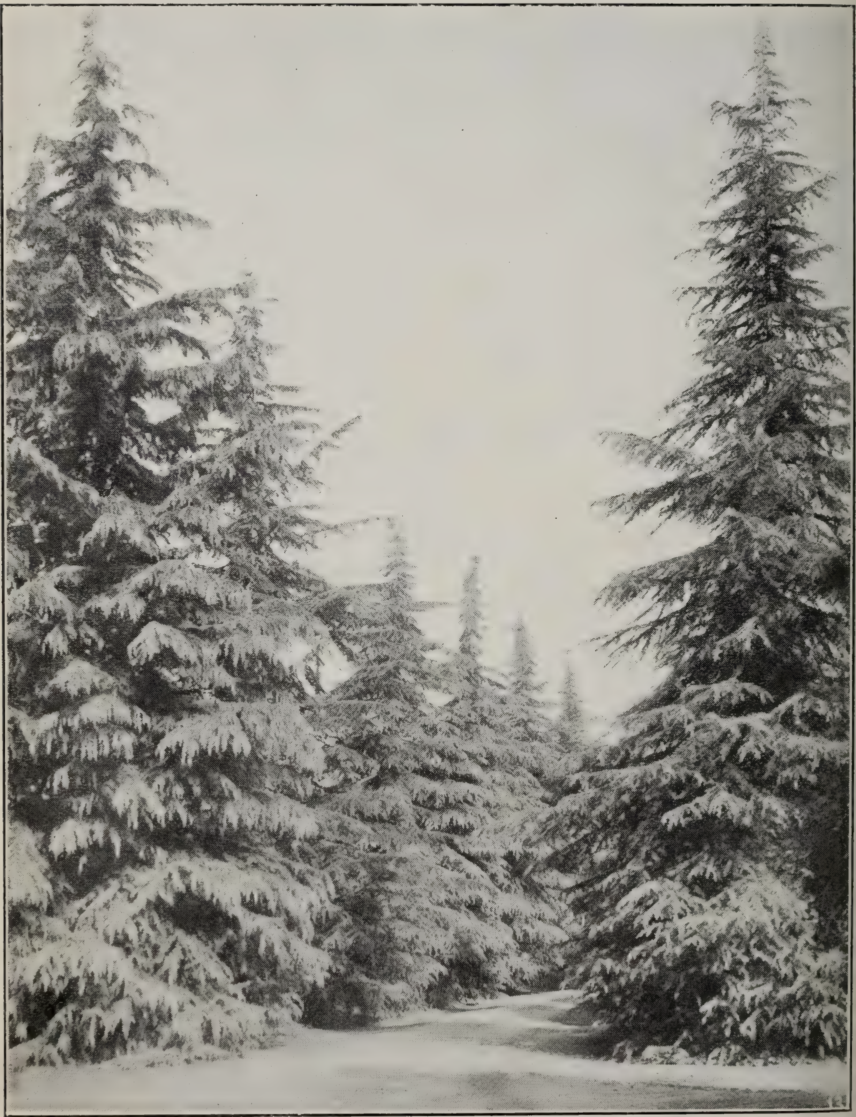
15. Did your locomotives cause any fires during 1917? No, 16; no reply, 7.

16. Do you burn your railroad rights of way as a means of fire protection? Yes, 5; no, 10; no reply, 8.

17. Kindly give any recommendations or suggestions you may have for the prevention of fires within the redwood region. Burning slash under proper supervision by company, 12; exclusion of hunters and campers, 4; state aid for providing patrol and building fire trails, 3; protective associations and plenty of publicity, 1; no hazard and no need for protection, 3.

There is one protective association in the redwood belt. It has its headquarters at Fort Bragg and represents a patrolled area of about 100,000 acres on the Ten Mile and Noyo rivers watersheds in Mendocino County. About 77,000 acres are assessed for the purpose of protection, and two regular patrolmen are employed with extra men during the dangerous fire season. During the season of 1918 the secretary reported no serious fires in the district controlled by the association, but stated that it was necessary to fight fires outside the district which threatened to burn over association timber.

A barren stretch of state highway, seventeen miles in length, which was planted by Kern County with poplar, sycamore and ash trees. The California Highway Commission cares for these trees, which will not only protect the roadbed from the extremes of heat and cold, but will also beautify the highway and furnish welcome shade to the many thousands of travelers who pass over it.



Avenue lined with deodar cedars at Kearney Park, showing the effect obtained through the use of an evergreen as a roadside tree.

STATE NURSERY.

It becomes necessary to again call attention to the necessity for and the importance of the establishment of a state nursery, where nursery stock may be produced in sufficient quantities to accomplish definite purposes. Chief among these are the proper planting of the highway system, and the furnishing of stock for the beautification of school grounds and small parks in rural communities. Any endeavor looking toward the improvement of rural conditions deserves consideration.

The people of the state are interested in the proper planting of the highways, as evidenced by the passage at the last session of the legislature of chapter 475, authorizing the construction of such a nursery. Unfortunately, the provisions of the act were such that this department was prohibited from complying with the real purpose of the act, in that the appropriation was insufficient and because it provided that the nursery should be located upon lands owned by the state or donated to the state for this purpose. The State Board of Forestry was unable to secure a suitable site upon lands now owned by the state, and it has none of its own. Two tracts of land were offered the State Forester, one of which was unsuited to the purpose, and the other offer was withdrawn, since the property was considered too valuable to be parted with without compensation.

Granted that labor conditions will preclude some of this work at present, it must be borne in mind that much of the nursery stock will not be ready for final planting for three or four years after the nursery is established. Much of the work will be splendid for returned soldiers —particularly those in need of out-of-door occupations.

The last two years of drouth have impressed upon many persons the need of commencing serious study of the watershed problems in those portions of the state where a supply of water sufficient for irrigation could be had during the dry season as the result of proper forest planting. Such problems can not be solved by the individual without having established experimental plantations on different soils and under different climatic conditions, with a view of determining the kind of trees to be used to obtain the desired result with the least expense. I am inclined to believe that much of this reforestation, as a matter of fact, must be undertaken by the state, possibly in co-operation with private owners, if any definite results are to be accomplished. These matters have been under consideration for a great many years. The need for water in our semiarid regions is well known, and it is useless to discuss further the need when all that is necessary is an intelligent solution of these well recognized problems.

I recommend, therefore, most earnestly that an adequate appropriation be made for the construction and maintenance of a state nursery, and that funds be made available either for the purchase or rental of twenty-five acres of land necessary for its establishment.

FOREST PLANTING IN THE ARID REGIONS OF SOUTHERN CALIFORNIA.

INTRODUCTION.

This study was made to furnish information to those who are interested in the planting in the arid regions of southern California, especially Imperial Valley, Coachella Valley, Mojave River Valley, Antelope Valley, Fremont Valley and Owens River Valley. Particular attention is paid to the establishment of plantations and windbreaks. Many helpful suggestions for street and highway planting will be found in Bulletin No. 4, California State Board of Forestry, which will be furnished free upon request.

It is extremely desirable to plant trees in arid regions for windbreaks, fuel, fence posts, ornament and shade, and the selection of the right species for these purposes has been made the subject of a careful study on the ground. Climatic and soil conditions make the success of planting somewhat uncertain, and it will be necessary to do a certain amount of experimenting before the possibilities and the limitations of the respective species can be definitely determined. Many of the species recommended in this circular have been tried out with success. Others have habits suitable for planting in arid regions but must be regarded as experimental until their ability to meet adverse conditions has been demonstrated.

Growing trees is no more difficult than growing agricultural crops if they are given the same care and attention. It is not advisable to plant trees on land that has no value for agriculture, since most trees, especially in arid regions, need good soil and moisture conditions to do well. In many cases the cost of a plantation can be greatly reduced by the growing of agricultural crops between the trees. The trees and crop can be cultivated and irrigated at the same time until the trees have developed so that intercropping can no longer be successfully practiced.

FACTORS INFLUENCING PLANTING IN ARID REGIONS.

Climatic and soil conditions.

Unfavorable climatic and soil conditions hinder forest planting and limit natural growth in all regions. A large number of good trees could be chosen, which would do well in many localities if it were not for some one limiting condition. Take, for example, the wide extremes of temperature, which range from below freezing in the winter to over the one hundred mark in the summer. In order to withstand such temperature variations a tree must be able to endure the heat of the tropics and the cold of the more temperate climates. Extreme natural

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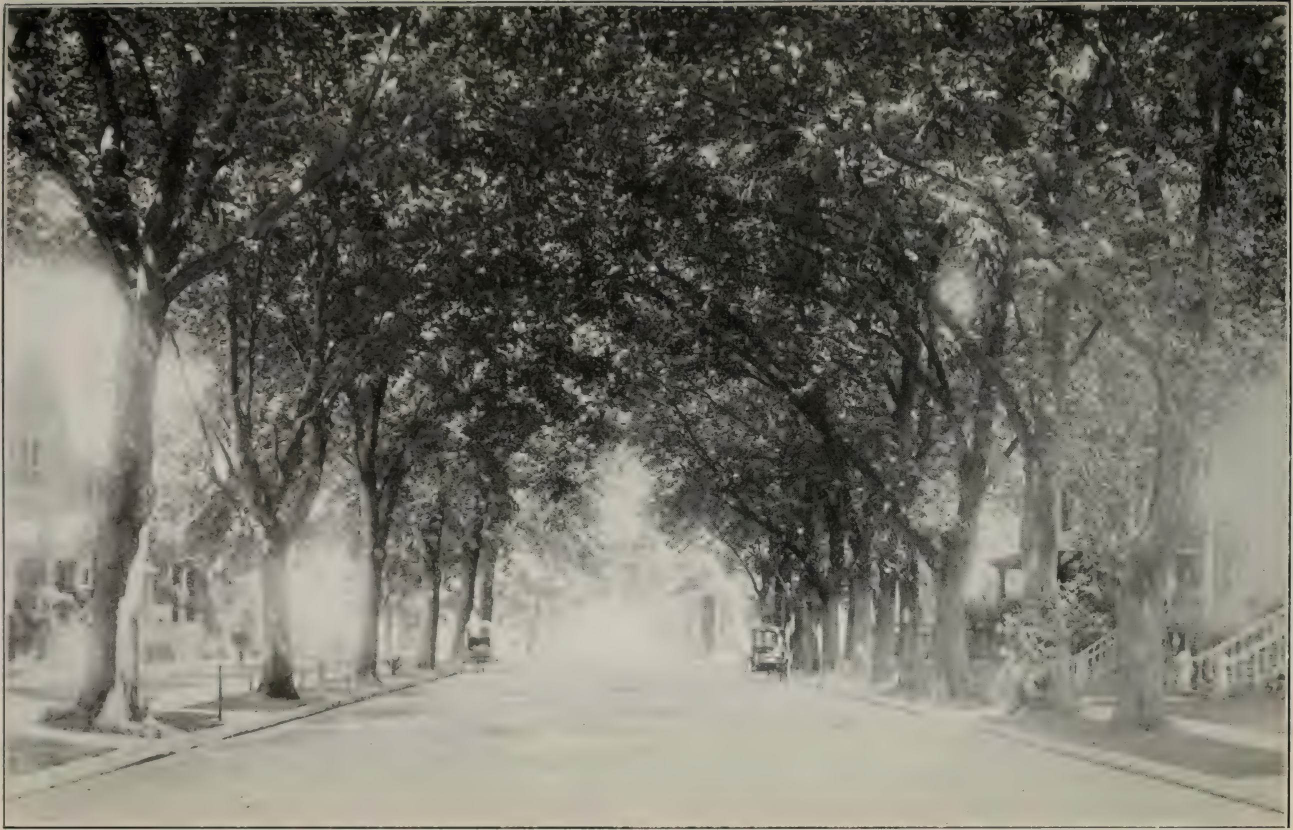

Elms used for street planting in Sacramento, showing the effect obtained through the use of a deciduous species.

The trees making up the above windbreak were planted in two rows but ten years ago. They are irrigated by a ditch between the rows.

temperature, supplemented by a high humidity, is very favorable to plant growth, but where the humidity is low and evaporation high, only the hardiest of trees can grow.

High winds are generally prevalent in the desert and arid regions of southern California during certain times of the year. These winds greatly increase evaporation, thus diminishing an already limited moisture supply and thereby effectually retarding tree growth. Trees must have strong trunks and branches to withstand such winds. Drouth or exceptionally light rainfall is another factor which severely affects the growth. Evidence of the effect of these unfavorable conditions is shown by the stunted and slow-growing species native to arid regions.

Characteristic climate in specified localities.

The localities in which tree planting is more likely to be carried on are chiefly confined to those areas which are now being taken up and reclaimed, namely: the Imperial area, including the Coachella Valley in Riverside County, the Mojave River country west to and including Antelope Valley, the Fremont Valley, northeast of Mojave, and the Owens River Valley in Inyo County.

The following table gives a good idea of the climatic conditions found in these localities. It is a good example of average conditions to be expected, since the year 1913 registered lower temperatures than usual in the winter and fairly average temperatures in the summer. The rainfall was rather light. Mojave and Calexico show rainfall in July and August, respectively, both untimely precipitation. Frosts can be expected in most desert and arid regions at irregular intervals during the winter months.

Table Showing Local Climatic Conditions.*

Locality		Temperature			Precipitation		Elevation.	Snowfall.
Town	County	Maximum	Minimum	Mean annual	Annual	Highest monthly		
Barstow	San Bernardino	July 11 110°	Jan. 7 12°	65.5°	3.60″	1.17″ Feb.	2105′	2.0″
Calexico	Imperial	July 9 115°	Feb. 7 21°	69.9°	1.88″	1.09″ Aug.	0′	0.0″
Independence	Inyo	July 10 103°	Jan. 7 4°	54.5°	7.36″	2.74″ Feb.	3907′	0.8″
Indio	Riverside	July 11 117°	Jan. 8 16°	71.9°	1.95″	0.93″ Feb.	−20′	0.0″
Mojave	Kern	July 11 112°	Jan. 6 10°	61.8°	2.69″	1.75″ July	2751′	2.2″

*U. S. Weather Bureau Report, 1913, California Section.

From the foregoing table a number of conclusions can readily be drawn, the most significant being:

That it is useless to plant trees in certain of these localities and expect them to grow if they will not stand considerable frost in the winter and early spring.

That it is absolutely essential that trees planted must be able to withstand high temperatures combined with low humidity and high evaporation during the summer months.

That, on account of limited precipitation, irrigation is necessary, with but few exceptions, in order to furnish the moisture necessary for tree growth.

Soil conditions in specified localities.

Soil conditions have a great deal to do with the development of a tree. Good soils are requisite where best results are secured. For the most part, however, soils of the arid regions are good and, in many instances, extremely fertile, except where the alkali content is high.

IMPERIAL AREA.

Soils vary from clay to sand and gravel. The greater portions are made up of clay and silt, and sand and silt, with the heavier soils predominating. The soils show great variations in stratification in depths of six feet. Few tracts of forty acres or less show soils of like characteristics because of the great variation in composition. The soils are more or less alkali in spots.

INDIO AND COACHELLA VALLEY.

Soils very sandy, with gravel and clay, and different gradations of loam. Soils stratified, with alkali in spots.

MOJAVE VALLEY DISTRICT.

Soils sandy and sandy loam; little clay and some silt; slightly stratified; free from large amounts of alkali.

ANTELOPE VALLEY, INCLUDING FREMONT VALLEY AND ROCK CREEK.

Soils rich, sandy loam and fine sands with irregular clay mixtures locally; somewhat stratified; considerable alkali in spots.

OWENS RIVER VALLEY.

Soils deep, alluvial granite, varying from sand to sandy loam with a little clay; more or less stratification showing in the vicinity of Owens Lake; alkali confined principally to the areas immediately adjoining the river and lake basin.

Alkali in soils.

Few trees thrive in soils which have a large amount of alkali. It is therefore not advisable to plant extensively under such conditions. There are, however, a number of species that will live in soils of a low alkali content, and, if the proper precautionary measures are taken, will do exceedingly well.

Seedlings should never be set out in the dry season or early part of the rainy season in soil which contains alkali, since the alkali lies near the surface at these times and the roots of the young plants are liable to injury. Young seedlings should be planted in the latter part of the rainy season, when the soluble alkali salts have dissolved and gone down. Planting at this time will give the young seedlings a chance to develop a comparatively hardy root system before the alkali rises. Later when the alkali does rise, the roots will in all probability be below it.

The three most important alkali salts are sodium carbonate, sodium sulphate, and sodium chloride. The sodium chloride and sodium sulphate are called white alkali. These two are less injurious to tree growth than sodium carbonate, the so-called black alkali.

The following facts relative to alkaline soils have been demonstrated in dealing with the problem of plant life versus alkali :*

> ''That the distribution of alkali and of its salts in any plot is very irregular.
>
> ''That great differences both in quality and in amount exist at distances of but a few feet or even less.
>
> ''That a plant may live and grow in one part of an alkali spot, and yet be killed by stronger alkali if planted but a few feet distant.
>
> ''That an analysis giving the composition of the soil at one point of an alkali spot may fail utterly to represent the amount of alkali of other portions, * * *.
>
> ''That the examination of an alkali spot downward is important in order to ascertain whether the alkali extends to great depths, as in some parts of California, or not more than three or four feet, as is usually the case.''

ALKALI RESISTANT TREES.

Stand a small amount of alkali.

Arizona ash, silver acacia, black wattle, Huntington elm, gray gum, California walnut, Russian olive, Carolina poplar, Lombardy poplar, cork oak, Monterey pine, Monterey cypress.

Stand considerable alkali.

Desert gum, red gum, sugar gum, honey locust, black locust, umbrella tree, mesquite, Russian mulberry, Aleppo pine.

PURPOSE OF PLANTING.

For fuel.

The scarcity of a local supply of firewood is already being felt in many localities, and in some instances wood is being shipped in. In the past, those who settled the arid regions relied on the meager growth of juniper, mesquite and cottonwood as a source of fuel, and nothing was done to perpetuate or increase the supply. Juniper and mesquite are good fuel woods but on account of their slow-growing qualities it is impracticable to plant them for fuel. Cottonwood is fast growing, but has low value as a fuel wood. In the production of fuel the planter should have but little trouble, if the proper species are chosen, since the trees require less attention than where they are grown for other purposes. With proper care a small area planted for fuel purposes can be made to yield very satisfactory returns, and where fast-growing species are used, the period between cuttings may be comparatively short.

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*"Tolerance of Eucalyptus for Alkali," R. H. Loughridge, Bulletin No. 225, College of Agriculture, University of California.

Planting for fuel should appeal especially to those who have difficulty in obtaining firewood. Distance from source of supply and cost of transportation constitute the main inducements to planting for fuel.

TREES SUGGESTED FOR FUEL.

Green ash, Arizona ash, catalpa, black locust, honey locust, palo verde, Arizona walnut, California walnut, silver acacia, box gum, gray gum, desert gum, red gum, Arizona cypress.

For windbreaks.

Windbreaks are giving good service to the farmers of the East and Middle West, and in some parts of the citrus belt in southern California, but so far only a few have been planted in the arid districts. Windbreaks are not only effective in protecting ranch buildings and stock, but are very efficient in shelting crops and orchards. They will no doubt be used extensively in Antelope Valley and especially in the Rock Creek and Mojave Valley districts, where pear and apple culture is fast coming into prominence. Windbreaks frequently furnish fence posts and firewood especially where a heavy windbreak is not needed. Several instances of this kind were noted in Imperial Valley, where windbreaks were used for this double purpose by making use of an occasional light thinning. Pollarding can be used to good advantage in this connection. Fuel wood and in some instances fence posts can be obtained by cutting the trees off at a reasonable height above the ground. This method does not defeat the purpose of the windbreak for any great length of time, and in some cases has proved to be better than thinning. A sprouting species should be used where this is done, so that good reproduction can be maintained. Where the location permits, good windbreaks can be grown along the line of permanent irrigation ditches with practically no care whatsoever, since the irrigation is taken care of by the flow of water in the ditches.

Considerable damage to crops could be avoided every year in these wind-swept districts by the presence of well-placed windbreaks.

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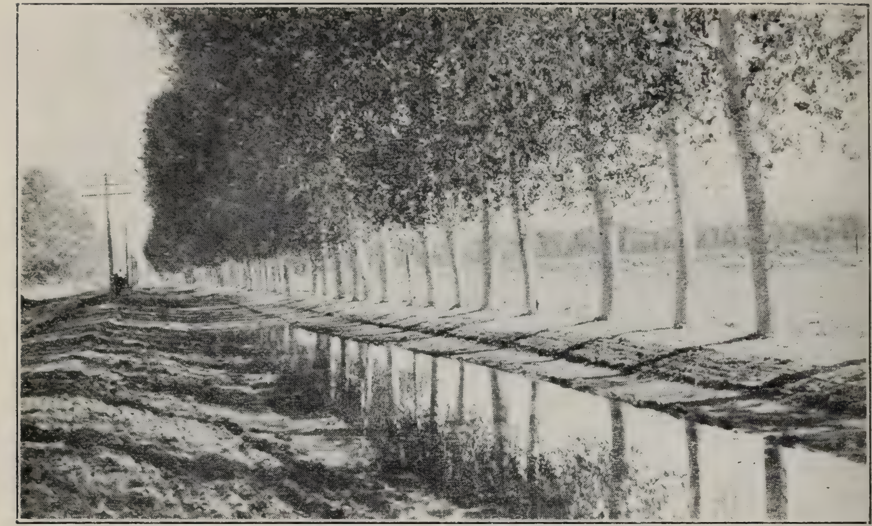
Windbreak of Carolina poplar in Imperial County, surrounding an alfalfa field similar to that in the foreground.



A highway in Imperial Valley planted with cottonwoods. These twelve-year-old trees furnish a welcome place for freighters to feed their teams in the heat of the day.

A windbreak of cottonwood growing along an irrigation ditch in Imperial Valley. The owner has made a thinning for posts and fuel. The openings made by the thinning will be closed in a short time by sprouts from the stumps.

TREES SUGGESTED FOR WINDBREAKS.

Arizona ash, green ash, Fremont cottonwood, black locust, honey locust, mesquite, palo verde, California box elder, Carolina poplar, Lombardy poplar, black wattle, silver acacia, box gum, gray gum, desert gum, red gum, sugar gum, Arizona cypress, Monterey cypress, Chinese arborvitæ, hackberry, Russian olive.

For fence posts.

The production of trees for fence posts will take more time and care than that required for growing fuel material or windbreaks. This is due to the requirements in form and size of trees suitable for making good fence posts. Some thinning and pruning will be necessary from time to time, and sufficient irrigating should be done to bring about a fast, healthy growth. If planted at correct intervals and properly managed, a plantation of this kind should produce good, straight trunks free of branches, the best possible fence post material. In cutting trees for fence posts the tops and branches can be utilized as fuel. Where fuel and fence posts are produced, the area between the rows can be utilized for the raising of garden crops, such as carrots, which make good stock feed, and many other varieties of vegetables.

TREES SUGGESTED FOR FENCE POSTS.

Arizona ash, green ash, catalpa, black locust, honey locust, silver acacia, box gum, gray gum, desert gum and red gum.

For ditch planting.

This class of planting will obviously be practiced only in localities, such as the Imperial Valley, where large irrigation canals are relied upon for water supply. Planting close to the main canals is not possible because a fifteen-foot right of way is needed on either side to facilitate ditch cleaning by traction engines. If the grade of a ditch is sufficient to cause the water to move rapidly and prevent silt from settling, planting can be done closer. On the smaller canals and farmers' ditches planting will largely prevent the rank growth of arrow willow and weeds which tend to gather silt and hinder ditch cleaning. Trees planted on small canals should be located far enough away to allow silt removal by hand. It has been pointed out how, in some cases, ditch planting may serve as a windbreak when the location and direction of the ditch permits. All ditch planting may serve as a source of fuel and fence post material.

TREES SUGGESTED FOR DITCH PLANTING.

Fremont cottonwood, palo verde, Carolina poplar, Lombardy poplar, silver poplar, weeping willow, red gum, Chinese arborvitæ, Monterey cypress.

For shade and ornamental planting.

Good shade trees are always appreciated, and especially in the arid districts. Only a small number of trees will be set out for shade purposes as compared with those for fuel and windbreaks. Good results should be obtained, due to the greater amount of care the individual trees are likely to receive. The same is also true of ornamental and street planting. Although this class of planting will not be in so much demand as the others, there are those who will plant ornamental species. The city of El Centro, in the Imperial Valley, has made much progress along these lines, the city having taken entire charge of the ornamental street planting.

TREES SUGGESTED FOR SHADE AND ORNAMENTAL PLANTING.

Green ash, catalpa, Fremont cottonwood, California box elder, hackberry, English elm, Huntington elm, mesquite, Russian mulberry, oriental plane, Carolina poplar, Lombardy poplar, Russian olive, umbrella tree, Arizona walnut, California walnut, weeping willow, black wattle, silver acacia, box gum, gray gum, desert gum, red gum, cork oak, Saint John's bread, Chinese arbovitæ, Arizona cypress, Monterey cypress, palo verde.

Species for planting.

The following list of trees which are apparently adapted for planting in the arid regions of southern California does not attempt to embrace every tree that might succeed. It is recognized that much experimenting will have to be done before the species that will best meet existing conditions of climate and soil will be found.

Irrigation is necessary to secure the best development of practically all the trees given, particularly after they are first planted. Few species will stand a sudden change from their habitat, but, if conditions are made to conform with the natural requirements of the young trees, they can be made to thrive under less favorable conditions as they grow older. Irrigation causes a rapid growth in the juvenile stage which gives the tree sufficient reserve energy to carry it along later under adverse conditions.

BROAD LEAVED DECIDUOUS TREES.

Species		Average height natural range, feet	Age	Rate of growth	Appearance	Nature of wood	Wood uses	Remarks
Common name	Scientific name							
Arizona ash	Fraxinus velutina	30-40	Medium	Medium	Stout branches form handsome round-topped head.	Medium weight and strength; close-grained and rather soft.	Fuel, posts, handles; posts not durable unless treated.	Good tree for general planting; avoid very dry location; makes an excellent street tree; stands some alkali.
Green ash	Fraxinus lanceolata	50-60	Medium	Medium	Broad rounded top of slender spreading branches.	Tough, straight grained, medium weight and strength.	Fuel, posts, handles; posts not durable unless treated.	Worthy of trial in Owens River Basin and Tehachapi country; does best on loam bottom land; responds quickly to care.
Catalpa	Catalpa speciosa	40-50	Medium	Rapid	Slender branches form a round-topped head; showy flowers; large heart-shaped leaves.	Light, soft, very durable	Fuel, posts, ties	Requires rich soil and much attention; other species of catalpa not advisable.
Fremont cottonwood	Populus fremontii	80-100	Short	Rapid	Stout spreading branches form an open head.	Light, soft, close-grained; not durable unless treated.	Fuel, posts	Too short lived for street and ornamental planting; grows best in moist soil; does not resist alkali well.
California box elder	Acer negundo californicum	50-60	Short	Rapid	Trunk divides near the ground into a number of wide spreading branches; young branches light green; handsome when in bloom; good foliage.	Light, soft, close-grained, brittle	Fuel	The hardiest of the maples but subject to red spider in hot, dry weather; does best on heavy soil.
English elm	Ulmus campestris	80	Long	Medium	Spreading branches form an oval head; suckers abundantly; branches more or less corky.	Strong, tough, heavy	Fuel, handles	A fine shade tree which does well in the upper Owens River Basin; worthy of trial elsewhere.
Huntington elm	Ulmus vegeta	100	Long	Medium	Erect habit; bark clean and smooth; foliage dense; leaves large, dark green.	Strong, tough, heavy	Fuel, handles	Well suited for street because of long life, neatness, symmetrical habit and resistance to alkali.
Hackberry	Celtis occidentalis	100	Long	Medium	Strong, spreading growth; leaves resemble those of nettles; berries orange red.	Fine-grained, medium strength and hardness.	Fuel, poles; posts when treated	Hardy tree suited to a variety of soils, but does not stand alkali.
Black locust	Robinia pseudacacia	80	Long	Rapid	Small, erect branches form a narrow, oblong head; showy flowers in drooping-clusters.	Heavy, hard, strong and durable	Fence posts, fuel and handles	One of the best all around trees; grows under adverse conditions, and will stand considerable alkali.
Honey locust	Gleditsia triacanthos	100	Long	Rapid	Spreading branches form a broad, open, flat-topped head; gray bark and finely divided feathering foliage.	Heavy, hard, strong and durable	Posts, fuel and handles	Good tree for general planting; does best on heavy loam; stands considerable alkali.
Mesquite	Prosopis juliflora glandulosa	40-50	Long	Slow	Round-topped tree formed by gracefully drooping branches.	Heavy, hard, strong and durable	Posts, fuel	Well adapted to arid regions. Growth can be increased by cultivation.
Russian mulberry	Morus alba tartarica	50-60	Medium	Rapid	Smooth branches forming a dense round-topped, shapely head.	Medium heavy, hard, strong and durable.	Posts, fuel	Dense foliage and low branching habit makes tree good for windbreaks; does well on alkali soil; objectionable for street planting because of abundant fruit.
Russian olive	Elaeagnus angustifolia	20	Long	Medium	Shrubby appearance; develops into dense hedge, which spreads out close to the ground; silver foliage.	Heavy, hard, durable	Fuel	Thrives on dry soils. Hardy for windbreak and ornamental planting.
Palo verde	Cercidium torreyanum	20-30	Long	Slow	Irregular top of many olive green, fine branchlets covered with yellowish green bark.	Medium heavy and strong	Fuel	Hardy native tree of the southwest which stands alkali well.
Oriental plane	Platanus orientalis	80	Medium	Medium	Forms fine spreading, graceful head; leaves large, dark green and deeply lobed; thin bark peels off in flakes.	Soft, light, medium weight	Fuel; not good for posts unless treated.	Excellent tree for street planting; almost entirely free from disease or pests.
Carolina poplar	Populus deltoides carolinensis	60-80	Short	Rapid	Forms wide spreading head with good foliage.	Soft, light, not durable unless treated.	Low grade fuel and posts	Does well in Imperial County on ditches; grows best on moist soils; suckering habit and short life unfits it for good street tree; must be underplanted when mature if used for a windbreak.
Lombardy poplar	Populus nigra italica	80	Short	Rapid	Pyramidal style of growth gives it a picturesque form.	Soft, light, not durable unless treated.	Low grade fuel and posts	Does well in Inyo County where it stands some alkali; formal tree widely used in landscape work.
Umbrella tree	Melia azedarach	40	Medium	Rapid	Umbrella like, broad leaves, finely divided; flowers lilac colored and fragrant.	Light, soft and brittle	Low fuel value	A second choice tree for street and ornamental planting; branches easily broken; flesh of berry slippery underfoot.
Arizona walnut	Juglans rupestris	50	Long	Medium	Short trunk with stout branches forming a narrow head with drooping habit.	Heavy, moderately strong	Fuel, posts	Does well in Tucson, Arizona; makes attractive shade and ornamental tree.
California walnut	Juglans californica	75	Long	Rapid	Stout branches form symmetrical round-topped head.	Heavy, moderately strong	Fuel, posts	Excellent shade and highway tree; thrives well on any good soil.
Weeping willow	Salix babylonica	40	Short	Rapid	Pendulous branches give tree a weeping habit.	Light, brittle	Low fuel value	Chief value is for ornamental and ditch planting; needs plenty of moisture.

BROAD LEAVED EVERGREENS.

Species		Average height natural range, feet	Age	Rate of growth	Appearance	Nature of wood	Wood uses	Remarks
Common name	Scientific name							
Silver acacia	Acacia decurrens dealbata	60	Long	Rapid	Graceful feathering foliage and symmetrical rounded top; fragrant, yellow flowers.	Moderately heavy and hard; rather brittle.	Fuel, posts, handles.	Both trees do well in Imperial Valley; stump sprouts if the tree is cut down; should not be given too much water.
Bailey's acacia	Acacia baileyana	30	Short	Rapid	Beautiful foliage and flowers.	Moderately heavy and hard; rather brittle.	Wood little used.	High value for ornamental purposes.
Red box	Eucalyptus polyanthemos	100-120	Long	Rapid	Growth branched and very picturesque; silvery foliage; white flowers borne in clusters.	Heavy, hard, strong.	Fuel.	All the species of eucalyptus grown do well in Imperial County; desert gum is reputed as being the most resistant to alkali.
Gray gum	Eucalyptus tereticornis	100-120	Long	Rapid	Tall shade tree with drooping branches; leaves long and broad, grayish green.	Dense, heavy, tough, strong; checks badly in seasoning.	Fuel, posts, handles.	Eucalypts give a heavy shade and are well adapted for windbreaks; they readily sprout from the stump when cut and produce fuel rapidly.
Desert gum	Eucalyptus rudis	75-100	Long	Rapid	Branches have compact habit; rough, gray, persistent bark.	Dense, heavy, tough, strong; checks badly in seasoning.	Fuel, posts, handles.	
Red gum	Eucalyptus rostrata	100-120	Long	Rapid	Narrow foliage; small flowers borne in clusters.	Dense, heavy, tough, strong; checks badly in seasoning.	Fuel, posts, handles.	
Sugar gum	Eucalyptus corynocalyx	90-100	Long	Medium	Broad, attractive foliage and rather slender top; smooth bark; showy young growth.	Dense, heavy, tough, strong; checks badly in seasoning.	Fuel, posts, handles.	
Cork oak	Quercus suber	60	Long	Medium	Growth upright, but with drooping branches; leaves much resemble those of live oak.	Hard, strong, heavy.	Fuel.	Should do well in Owens Riven Basin, Tehachapi Pass and Mojave country.
Carob	Ceratonia siliqua	40	Medium	Medium	Regular growth with spreading branches forming a rounded head; foliage a deep and shining green.	Weak, brittle.	Poor fuel.	Tree of great beauty, but liable to be split by the wind or weight of the branches.

CONIFEROUS EVERGREENS.

Common name	Scientific name	Average height natural range, feet	Age	Rate of growth	Appearance	Nature of wood	Wood uses	Remarks
Chinese arborvitæ	Thuya orientalis	30	Long	Medium	Short, brushy tree with small bright, green leaves.	Medium hard and heavy.	Fuel.	Very successful in Imperial Valley: Admirably adapted for windbreaks.
Incense cedar	Libocedrus decurrens	100	Long	Medium	Columnar shape; spreading branches, clothed with compact, bright, glossy, green foliage.	Light, soft, durable.	Posts, fuel, shingles.	Provides dense shade; hardiness makes it worth a trial; prefers moist, porous soil.
Himalaya cedar	Cedrus deodara	100	Long	Medium	Pyramidal in outline; lower limbs lie on the ground; upper limbs droop.	Light, soft, durable	Posts, fuel, shingles.	Unexcelled for ornament and shade; should do well in arid regions.
Arizona cypress	Cupressus arizonica	50	Long	Medium	Branches form a narrow compact pyramid; foliage has a silvery color.	Heavy, hard, strong.	Posts, fuel.	Handsome ornamental tree.
Monterey cypress	Cupressus macrocarpa	75	Short	Rapid	Branches form a bushy head, spreading in old age to a flat topped crown.	Heavy, hard, strong.	Posts, fuel.	Dense foliage makes tree very good for windbreaks.
Aleppo pine	Pinus halepensis	60	Short	Rapid	Spreading habit; short needles light yellowish green.	Light, soft, durable.	Fuel.	Should do well in Mojave and Owens River basins.
Monterey pine	Pinus radiata	100	Short	Rapid	Spreading branches form open, round topped head.	Light, soft, durable.	Fuel.	Native pine planted extensively in Australia as a timber tree; worthy of trial in arid regions.
Torrey pine	Pinus torreyana	50	Medium	Medium	Short trunk with stout spreading branches.	Light, soft, durable.	Fuel.	Native pine planted in England and Australia for ornamental purposes.

Choice of species.

The planter must decide what species he wants to plant on the basis of their adaptability to the conditions of his own locality. For best results trees should have a margin of resistance against any prevailing unfavorable climate or soil conditions. The purpose of planting trees is not merely to have them exist, but to have them thrive and in many cases yield a commodity. If quick results are expected, it would be poor policy to choose a slow-growing species, and if fuel is desired, the question of relative fuel value should be given special consideration. In choosing species for planting, it is always a good plan to take the class of material growing in the local nurseries and the desirable native growth as a guide.

Preparation of ground.

Much attention must be paid to the preparation of the soil in which the trees are to grow. It should be worked as deep as possible in order to give the roots a chance to grow down deep. If the soil is hard and packed trees will be forced to become shallow rooted, and will early blow over when the soil becomes water soaked. If it is not feasible to plow and harrow the whole area to be planted, it is a good plan to plow several furrows along the line of each row to be planted. If there is to be intercropping, however, the entire area should be strongly worked. Young seedlings may be set out without preparing the ground in any way, but this is not advisable unless the water table is close to the surface and very little irrigation is necessary, a condition seldom encountered in the arid region. The physical condition and fertility of many soils can be greatly improved by the addition of stable manure or lime.

Time of planting.

The best time to plant is after the rainy season when all danger from a late frost has passed. It is generally safe to plant in March. It is not advisable as a rule to plant in the late fall or early winter, since heavy frosts are liable to occur which will injure any new growth that may have started. Fall or winter planting should be undertaken only in localities where severe frosts are exceptional. It is a decided advantage to plant on damp, cloudy days, when protection can be afforded the tender roots from the hot sun and wind.

Method of planting.

The best results are obtained by using transplants which are young trees that have been removed from the original seed bed to beds where there is space to develop sturdy stocks and root systems. It is not always possible to obtain transplants, but if seedling stock is used care should be taken to get as sturdy plants as possible. Plants from 16 to 36 inches high are a good size for planting.

The roots of young trees to be planted should never be exposed to the sun or drying air. Stock can be transplanted in cans, paper pots, or with the roots protected by earth bound with burlap. The roots of trees that are packed in crates should be well moistened before removal. Where cans are used the young trees should be removed with as little exposure as possible. Paper pots should also be removed since the plant may become root bound by the time the paper decays. If the trees are not planted upon their arrival, they should be planted in a shady place and sheltered from the drying effect of the wind. They should be watered moderately until set out. If kept for any length of time before setting out and given too much water, they are apt to become succulent, and too tender for planting in hot, dry situations.

The best method of planting is by the deep-hole method. The hole should be dug wide and deep enough to accommodate the tree roots without crowding. Large rocks and sod should not be put back in the hole after the tree is planted since air space may be left which will cause the plant roots to dry out. Holes should not be dug a long time in advance of planting on account of the danger of drying out. Plants should be well watered at the time of planting in order to settle the soil around the roots. It is not a good plan as a rule to put manure in direct contact with the roots since there is danger of ''burning'' them.

Spacing.

The purpose of the planting has much to do with the spacing. If the purpose of the planting is to produce fuel and posts, the best results can be secured by regularly spacing the trees over the entire area. Spacing should not be closer than 6 by 6 feet, and in most places a spacing of 8 by 8 feet or even 10 by 10 feet gives best results. The latter spacing allows for cultivation between the trees without danger of injuring them. Wide spacing with frequent cultivation is productive of better results than close spacing and less frequent cultivation. If the trees are planted too close, and allowed to remain until maturity, those in the center of the plantation are apt to be inferior in diameter growth. An instance of this kind is noted in a plantation of eucalyptus in Berkeley where the spacing was 7 by 7 feet. The outside trees averaged 30 inches in diameter and 120 feet high. Those in the center of the plantation were the same height, but averaged only 10 to 12 inches in diameter. The diameter growth of the plantation could have been made more nearly uniform if there had been wider spacing, and a thinning of the poorly-formed trees. In later plantings in the locality a uniform 10-foot interval was adopted.

In planting a windbreak, the trees should be spaced much more closely in the row in order that the branches may reach the ground, shade out the weeds and grass, and make a dense shelter and an effective hindrance to the wind. A very good method is to plant tree rows from five to six feet apart. The trees in these rows should be alternating and from five to six feet apart. Both rows can be irrigated by one central ditch. If the windbreak is planted in two rows with a fast growing species which reproduces by sprouting, one row can be utilized for fence posts or fuel when it has attained sufficient size without materially impairing the value of the windbreak. Later on, when the sprouts have reached a sufficient height to serve as a windbreak, the other row can be utilized in the same way.

The following table gives the number of trees per acre when spaced in squares:

Spacing, feet	Number of trees	Spacing, feet	Number of trees
4 by 4	2,720	12 by 12	324
6 by 6	1,210	14 by 14	222
8 by 8	680	16 by 16	170
10 by 10	435	20 by 20	109

Care of trees.

After the trees have been planted they should be supported by redwood stakes for protection against severe winds which are liable to break or uproot them. The method of irrigation is the same as for fruit trees. Three good irrigations, with proper attention to cultivation, should be sufficient to produce a thrifty growth. Cultivation greatly encourages the growth of the trees. It should be shallow so as not to injure the roots of the trees. The soil should be worked into a dust mulch which will keep down weeds and save the moisture in the ground.

A plantation should not be used as a pasture for stock which break down and bark the trees as well as make the ground hard and dry. Fire should be guarded against by plowing fire lines five to six feet wide around the area. Rabbits and gophers cause considerable damage at times, but may be destroyed by poisoning with strychnine. Information on this matter may be obtained from the Horticultural Commission, Sacramento.

Thinning.

The object of thinning is to produce well-formed trees suitable for fuel, posts and poles. When trees are young they can stand considerable crowding without injurious effects. All of them grow in height for a while, but soon the thriftier trees take the lead and the weaker ones begin to decline. At this stage thinning should be practiced to remove the weak trees which are taking space and nourishment from the thrifty ones. The removal of deformed and unhealthy trees, and those which are slender in proportion to their height will greatly improve the condition of the plantation. The trees that are left will increase in diameter and be of much more value than if the plantation had been left in its original state. If the thinning is not too severe the opening in the tops should close in three or four years. The trees will tend to branch toward the openings made, and soon shade enough to keep down the grass and lessen the evaporation of water from the soil will be afforded.

Pruning.

Pruning is the cutting away of dead, unsightly and useless branches. When properly done it stimulates growth and improves the form of the tree. Pruning is not necessary until the plantation is well developed and the trees begin to crowd. Many trees have a tendency to branch near the ground. When the lower limbs are removed, a straight stem will be produced. Pruning should not be too severe, else the tree will not have enough crown to supply food material for growth, and is liable to be broken or deformed by wind because of its top heaviness.

Pruning is best done in the fall or winter when the sap is not flowing. The cut should be made clean and close to the trunk so that the wound will heal quickly. Stubs left on the surface afford access to wood-rotting fungi which cause decay in the stem. Large limbs are best removed by making two cuts in the branch, one on the underside of the tree and the other on the upper side about fifteen inches beyond the lower cut. The stub can then be cut close to the trunk after the limb has fallen.

REFERENCES.

Bailey, L. H.
Standard Cyclopedia of Horticulture.

Bailey, G. E.
California Soils.

Holmes, —.
Soil Survey of the Imperial Area, Bureau of Soils, U. S. Department of Agriculture.

Gregg, J. W., Bulletin No. 20.
California State Board of Education.

Jepson, Willis Linn.
Silva of California.

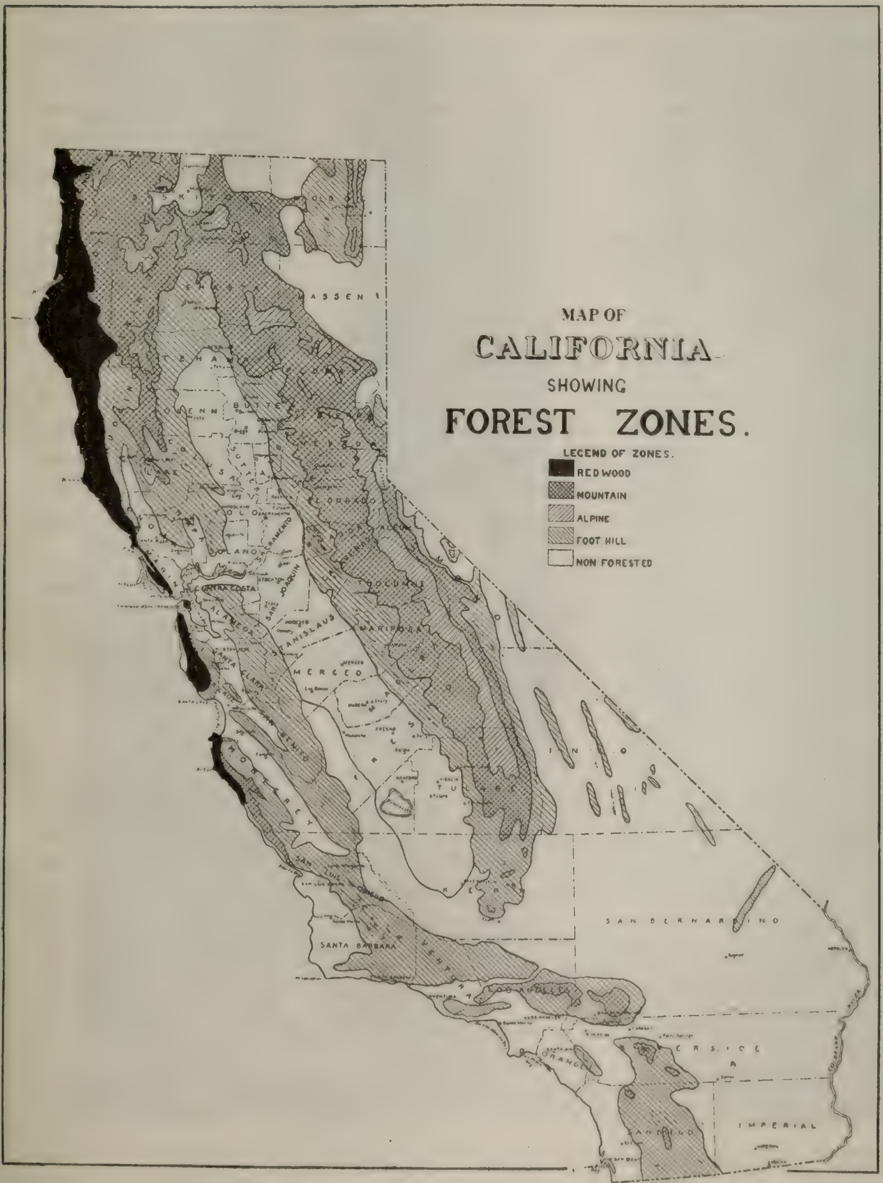
Kirkegaard, John.
A Practical Handbook of Trees, Vines and Herbaceous Perennials.

Loughridge, R. H.
Tolerance of Eucalyptus for Alkali, Bulletin No. 225, College of Agriculture, Agr. Exp. Station, Berkeley.

Morrison, Ben Y.
Street and Highway Planting, Bulletin No. 4, California State Board of Forestry.

Sudworth, Geo. B.
Forest Trees of the Pacific Slope.

Sargent, Charles Sprague.
Manual of the Trees of North America.


MAP OF
CALIFORNIA
SHOWING
FOREST ZONES.
LEGEND OF ZONES.
RED WOOD
MOUNTAIN
ALPINE
FOOT HILL
NON FORESTED
SISKIYOU
LASSEN
TEHAMA
GLENN
BUTTE
COLUSA
LAKE
YOLO
NAPA
SOLANO
MARIN
SACRAMENTO
SAN JOAQUIN
CONTRA COSTA
ALAMEDA
SANTA CLARA
STANISLAUS
TUOLUMNE
MARIPOSA
MERCED
EL DORADO
MONO
INYO
SAN BENITO
MONTEREY
TULARE
KERN
SAN LUIS OBISPO
SANTA BARBARA
VENTURA
LOS ANGELES
SAN BERNARDINO
ORANGE
RIVERSIDE
SAN DIEGO
IMPERIAL

FOREST DISTRIBUTION IN CALIFORNIA.

The State Forester is constantly being asked to furnish information on the distribution and characteristics of California trees. As a rule, detailed information such as can be obtained from several excellent books on this subject is not particularly desired, but rather a brief account of some of the most interesting features of the different species. To meet this need a general description of the most important trees has been prepared. In this connection, ''The Trees of California,'' by Professor W. L. Jepson; ''Manual of the Trees of North America,'' by Charles Sprague Sargent, and ''Trees of the Pacific Slope,'' by George B. Sudworth, have been freely consulted.

TOPOGRAPHY.

The topography of California is such as to limit the different species of trees to climatic zones. The forests lie mainly on the uplands in a fairly continuous belt which stretches up along the coast, across the highlands at the head of the Sacramento Valley, and southward down the Sierras, leaving the great interior valleys and the depressions in the southeastern portion of the state unforested or supporting only scattered trees.

Since the topography of the state greatly influences the general distribution of the forests, a brief description of its five physiographically natural divisions which are the Sierra Nevada, northern Coast Ranges, southern Coast Ranges, Sacramento and San Joaquin valleys, and southern California, is in order.

1. Sierra Nevada.

The Sierra Nevada Mountains extend along the inland border of the state in a southeasterly direction for a distance of five hundred miles. From Mount Shasta at the north with an elevation of 14,400 feet, to Mount Whitney, 14,502 feet in height, two hundred miles further south, they extend in an almost continuous crest with an average elevation of over 7,000 feet. The highest portion of the range is from Lake Tahoe to Mount Whitney, south of which the elevation gradually decreases. North of Lake Tahoe the system broadens out, and consists of several ranges with occasional valleys intervening.

The eastern slope is very abrupt and gives rise to few large streams. The western slope, which is the most heavily timbered, is more gradual, and the streams on this side of the divide are large and numerous. The range is new, geologically speaking, and the rivers flow for a part of their length through deep canyons, of which the Yosemite Valley is, perhaps, the most famous. The waters of many of the streams are used

Coast Redwood (Sequoia sempervirens). The interest in this tree not only lies in the fact that its individuals are next to the Sequoia gigantea, the largest trees in the world, but also in the fact that its naural habitat is confined to a strip along the coast of California not more than thirty miles wide and extending from Monterey County northward to southern Oregon, where three small groves occur in Curry County.

Sugar Pine (Pinus lambertiana). The Sugar Pine is the largest pine in the world, and is considered the most valuable tree on the Pacific coast. Its value lies in the excellent quality of the wood and the amount of high-grade lumber that can be obtained from it for finishing and remanufacturing purposes.

in irrigating the valley lands below, or for the generation of light and power.

2. Northern Coast Ranges.

The northern Coast Ranges extend north from San Francisco Bay to the Oregon line. The mountains nearest the coast on which the redwoods are found, average about 2000 feet in height. In this region are found beautiful valleys, the floors of which are adorned with groves of valley and live oak. The high main northern Coast Ranges are very rough and irregular, with an average elevation of about 5000 feet, with occasional peaks reaching 8000 feet. The principal ranges in this group are the Siskiyous, the Scott Mountains, the Marble Mountains, the Salmon Alps and the Trinity Mountains. They contain very little agricultural land, but support splendid forests of yellow pine and sugar pine. They are drained by the Klamath and its tributaries, the Scott, Salmon and Trinity rivers.

3. Southern Coast Ranges.

The southern Coast Ranges extend south from San Francisco Bay to the Tehachapi Range in the northern part of Santa Barbara County. This region supports little forest growth save for a stand of redwoods in the Santa Cruz and Santa Lucia mountains. As a rule the tree growth consists of scattered oaks and digger pines growing on rolling, semiarid hills.

4. Sacramento and San Joaquin valleys.

The great central valleys are 350 miles long and 40 to 60 miles wide, with an elevation ranging from sea level to 200 to 300 feet. They are drained from north to south by the Sacramento and San Joaquin rivers, which unite just south of Sacramento and flow west into San Francisco Bay, thence into the ocean through a break in the Coast Range, known as the Golden Gate. These valleys are treeless for the most part, tree growth being confined to river bottoms or moist alluvial lands.

5. Southern California.

At the southern end of the San Joaquin Valley, the Sierras and the Coast Ranges are connected by the Tehachapi Range. Tehachapi Peak runs to an elevation of over 8000 feet, but the mean altitude is about 5000 feet. The southeastern portion of the state consists of broad, depressed basins, hemmed in by mountains. In its natural state this region consists largely of deserts except for a narrow coast strip which is semiarid. Portions of the deserts are below sea level, while some of the mountains rise to 11,000 feet. The rainfall is insufficient to support anything but the scantiest growth and the trees most characteristic of this area are desert types, such as yucca, mesquite and desert ironwood.

FOREST ZONES.

As above shown, the topography of California is made up of alternate highlands and lowlands, parallel to the coast, the landward highlands having considerably greater elevation than the seaward. The forests of the state which occupy about one-sixth of its area, vary in character, composition and density according to their relation to climatic conditions. Since moisture and temperature conditions vary from place to place according to elevation, latitude and distance from the ocean, each of these three factors exerts its influence on forest distribution.

Points near the ocean have a cooler and more equable climate, other things being equal, than those in the interior; besides having more rainfall and greater relative humidity. Similarly, temperatures become cooler from south to north, and rainfall and relative humidity greater. The most abrupt variations in climate, however, are produced by differences in elevation, the effects on temperature being the same in going from a low elevation to a higher as in going from south to north, but much more noticeable in comparison to the distance traveled. Both rainfall and the relative humidity of the atmosphere also increase in a marked degree with increase in elevation.

Since the distribution of the forests of California is in accordance with rather sharply-defined climatic zones in which the forest conditions are generally similar, they can best be described by considering them under four zones which are closely related to the topographical divisions previously described. These zones are the Coast or Redwood Zone, the Foothill Zone, the Mountain Zone and the Alpine Zone. The proportional area occupied by each and its position in relation to the others, is made clear by the zonal map shown on page 57.

Coast zone.

The coast zone occupies a strip of land which rises precipitously from the sea from central Monterey County, northward to the Oregon line. In contains about 4000 square miles, of which 1,250,000 acres belong to the redwood belt proper. This zone which has its greatest width of 30 miles in southern Humboldt County, narrows to the north and south. South of Mendocino County it is often interrupted, and is largely confined to canyons facing the ocean.

The limits of the coast zone are determined by the range of the summer fogs. At the extreme north, and again at the extreme south, the mountains rise beyond the reach of the sea fogs and become a part of the mountain zone. The zone is crossed by a number of large rivers and streams which flow directly into the ocean. The valleys are usually narrow and canyon-like, with steep slopes; but along the larger streams occasional flats occur, and it is in these situations that the coast forest reaches its best development.

The soil is usually deep and of good composition, varying from a clayey to a sandy loam. On the upper slopes, with south or southwest exposure, it is often thin and light, and next to the ocean it is apt to be sandy, but in the main it is well adapted for forest growth.

The most important species of the coast zone is redwood, which forms solid forests of great extent in the northern part, and scattered groves to the southward. Its main distribution is in a belt extending from the Oregon line to the mouth of the Russian River. Of the outlying bodies of redwood, some of the most interesting are those in southern Curry County, Oregon, which mark the northern limit of the species, and California Redwood Park in the Santa Cruz Mountains, which is owned by the state.

The redwood type extends from sea level to an elevation of 2000, or occasionally 3000 feet. The finest forests, both as regards diversity and development of individual trees, occur in Humboldt and Del Norte counties on the flats along the larger streams or on the benches above them. In such situations redwood is found growing pure, or slightly mixed with Sitka spruce, Port Orford cedar, hemlock or lowland fir.

Typical redwood flats occur along the Eel River, and in Del Norte County. Here the trees are the tallest and largest representative of their species, and the density is such that yields of more than a million board feet have been obtained from a single acre. The great height of the trees and the density of the stand allow so little light to reach the ground, that the general effect is not unlike that of the interior of a cathedral, the illusion being further carried out by the columns of the redwoods themselves. Moss, oxalis and bracken fern form the usual undergrowth, the last growing in patches where the sunlight strikes.

On the slopes the redwood trees are not so large and there is a mixture rarely exceeding 25 per cent of subordinate species, such as Douglas fir, hemlock, red cedar and lowland fir. All of the subordinate species have their greatest development in the forests of the Pacific Northwest. The stand of timber ranges from 10,000 feet B. M. per acre up to 100,000 feet B. M. Exceptional redwood slopes have yielded as much as 400,000 feet B. M. per acre, but the average yield is much less than that of the flats.

The shore type occupies a narrow strip along the coast, seldom more than a mile wide. In some places it is crowded out completely by the redwood belt, although as a rule, the soil and situation are unsuitable to redwood. The strong ocean breezes to which it is exposed carry abundant moisture, but also induce excessive evaporation; and the sandy soil is not retentive of water. In consequence, this strip is comparatively drier than situations further inland where the winds are checked by ridges, and the soil is deep and loamy.

The forests of the shore type are very scattered, and although often dense, contain little merchantable timber. A number of the species inhabiting the coast line south from San Francisco Bay, such as Monterey pine, Monterey cypress, and Bishop pine form local areas of well-developed trees which have considerable value for cordwood. In general, however, the trees of the shore type are scrubby and deformed from exposure to the wind.

The shore type from Humboldt County northward consists largely of brush composed of salal, salmonberry and elder with scattered Sitka spruce, lowland fir, maple, laurel and alder near the mouths of streams. From Monterey County southward the brushy areas are less frequent, and broad areas of open grass land occur between the clumps of trees.

The Douglas fir type extends from the edge of the redwood belt across Del Norte and Humboldt counties, gradually changing in character as it spreads eastward and gains in elevation, until it finally becomes the mountain type of forest with yellow pine and sugar pine in the mixture. It is properly a transition type, connecting the coast zone with the mountain zone, and partaking somewhat of the nature of both. Its constituent species are common to both, but characteristic of neither. Along the western edge scattered redwoods occur, and on the eastern border yellow pine and sugar pine come in, but the bulk of the forest is made up of Douglas fir associated with more or less tanbark oak and black oak.

In the moister situations the forest consists almost wholly of Douglas fir growing in dense stand, and with excellent individual development. Toward the interior the type is largely confined to north and east slopes, and the shady side of canyons, the hotter and more arid localities being occupied by a scrubbier growth in which yellow pine is a constituent.

The stand of timber varies from 2000 to 25,000 feet B. M. per acre. Near the western edge of the type it is densest, and the growth and development of the trees are the best; and for this reason, as much as for any other, the type has been included with the coast zone rather than with the mountain zone. The average stand for the type is between 5000 and 10,000 feet B. M. per acre.

Foothill zone.

The foothill zone is distinguished by its semiarid climate and the open, brushy character of its forests. It occupies a position topographically as well as silvically between the well-timbered mountain zone and the treeless areas in the central valleys and the desert. It covers the lower slopes of the Sierras, the southern slopes of the northern cross ranges, both slopes of the inner ridges of the northern Coast Ranges and all but the summits of the southern California mountains. It ascends the east slope of the Sierras, is found on the mountains in the northeast corner of the state, and forms a belt in some of the desert ranges.

The elevation of the foothill zone ranges from 500 feet at the head of the Sacramento Valley to 4500 feet in the southern Sierras and San Jacinto Mountains. In the Santa Lucia Mountains, which parallel the coast south of Monterey Bay, the influence of the ocean lowers the elevation of the zone to a marked degree. At its upper limits the foothill type of forest mingles with that of the mountain belt, and at the lower levels it straggles out into the valleys and deserts.

The region covered by this zone is that of warm temperatures, and with about thirty inches of rain, most of which falls in the winter. As a consequence the soil, excepting near streams, is dry during the growing season with the result that the forests are open, the trees short and limby and there is an abundance of chaparral. Toward the north, grassy stretches valuable for grazing are frequent, but southward the chaparral becomes denser, and the open patches smaller in extent.

The competition between the chaparral and forest is very keen, but the chaparral has the advantage in that it sprouts after burning, whereas the trees, especially the conifers, are totally killed by fire. Since the aridity of the long summer season invites frequent fires, there is a tendency for the chaparral to gain ground at the expense of the forest.

The protection of chaparral areas in the foothills for watershed purposes is a very important matter in southern California. Here the area of forests is comparatively small and since water is scarce and very valuable it must be conserved by keeping the brush cover which regulates the run-off as intact as possible. Dense chaparral is very effective in this regard and is being protected against fire by the government in the mountains of southern California where it covers large areas.

The principal species of trees found in the foothill zone west of the Sierras north of the Santa Barbara Mountains are valley white oak, blue oak and digger pine. Valley oak has the lowest altitudinal range, occurring a little above the level of the valley. Blue oak ranges higher and digger pine extends up to the border of the mountain zone where it mingles with yellow pine, Douglas fir and other conifers. Numerous other species, such as Gowen's cypress, maple, buckeye, post oak, live oak and California laurel have a more or less limited occurrence in the foothill zone. Few of these species furnish saw timber, but the oak is cut extensively for fuel for foothill and valley towns.

From the Santa Barbara Mountains southward chaparral is the dominant feature. It contains very little usable material, its chief value being for watershed protection. Tree growth is very sparse, being confined to scattered patches in sheltered canyons and ravines. Big-cone spruce is found in small groves in the southern coast mountains and live oak and California laurel occur to a limited extent in favored locations.

Mountain zone.

The mountain zone is the most important of all the zones by reason of its great extent and valuable character of its forests. Its forests are not only a principal source of timber, but control the run-off of large and important watersheds as well. The best forests are found on the west slope of the Sierras at elevations ranging from 2000 to 5500 feet. On the eastern slope of the southern Sierras, the forests reach an elevation of 10,000 feet on dry slopes with southerly exposure, but are inferior at this elevation to those of the northern Sierras.

The mountain zone is characterized by a temperate climate and a fairly long growing season. Very little rain falls in the summer, but the winter rains are heavy, amounting to 35 inches or over. Since the humidity decreases with decrease in elevation the zone is bordered at its lower levels by the semiarid foothill zone, with the exception of where the mountain zone joins the coast zone or where it touches desert-like conditions directly.

The bulk of the forest in the mountain zone lies in what is known as the sugar pine-yellow pine region, which reaches its best development at elevations of from 4000 to 7000 feet in the western central Sierra Nevadas. The tree species are found in this region in about the following proportions: sugar pine, 15 per cent; western yellow pine, 38 per cent; Douglas fir, 19 per cent; white fir, 14 per cent; incense cedar, 3 per cent; California red fir, 4 per cent; lodgepole pine, 2 per cent; big tree, 2 per cent; other species, 3 per cent.

At high elevations western yellow pine is supplanted by Jeffery pine which greatly resembles western yellow pine and is sold with it under the trade name of California white pine. Douglas fir forms nearly pure stands in the northern Coast Ranges, but its proportion of the stand rapidly falls off to the southward. In the northern Coast Ranges small areas of big cone spruce, which is a close relative to Douglas fir, are found. Big tree is confined to small groves in the southern Sierras, much of it being located in national parks.

The merchantable stands in the sugar pine-yellow pine region yield from 18,000 to 40,000 board feet per acre, although there are stands on record of 200,000 board feet per acre. The most valuable species such as sugar pine and yellow pine are the most sought after. The tendency, therefore, is for the inferior species such as white fir and incense cedar to increase for the reason that the majority of seed trees left after lumbering are of these species. The abundant manner in which yellow pine reproduces itself from the few seed trees left, however, gives a fair proportion of that species in the new stand if fires are kept out. It is too often the case that fires follow lumbering and the result is that the opportunity of yellow pine to re-establish itself is lost and the burned-over areas become covered with brush and inferior species.

Alpine zone.

The Alpine zone has a range of 5000 to 8000 feet in northern California, extending in some places, as on Mount Shasta, beyond 9000 feet. In the Mount Whitney region in the southern Sierras, its limits are between 9500 and 13,000 feet on the west slope and somewhat higher on the east.

The composition of the Alpine forest changes greatly from point to point. As far south as the southern Sierras, California red fir is the most important species, and practically the only one in the zone that furnishes merchantable timber. Other species found, particularly toward the north, are western white pine, western hemlock, lodgepole pine, quaking aspen and dwarf maple. Above the main timber belt occur the timber line trees, most of them with conical trunks with buttressed bases, short branches and irregular tops. These include white-bark pine, foxtail pine and Sierra juniper.

The Alpine forest as a whole is a protective forest. It contains few merchantable species and as a rule, is too inaccessible to be logged profitably. The density of the forests of California red fir and western hemlock make them valuable in holding the snow and regulating the run-off. Much damage has been wrought by fire and as a result chaparral fields are common in the Alpine zone. The chaparral area is drier, the run-off is greater and the soil in consequence thinner and poorer. On the edge of most chaparral areas the forest is gradually encroaching, and under natural conditions would probably reclaim much of it. Whenever fires occur, however, the young trees that have started are burned with the brush and it is not long before the brush, which readily sprouts from the roots, forms dense areas in which it is difficult for seedlings to obtain a foothold.

NOTES ON PRINCIPAL CALIFORNIA SPECIES—CONIFERS.

Western yellow pine (Pinus ponderosa).

Western yellow pine lumber is advertised under the name of ''California white pine'' to convey the idea that it is in a class with eastern white pine for finishing and factory material. Botanically, western yellow pine is classed with the hard or ''yellow'' pines rather than with the soft or ''white'' pines, but the general character of the lumber cut is so soft and white that it can be properly classified with the true white pines.

The large size, excellent quality of the lumber and abundance of western yellow pine, makes it one of the three most important timber trees in California. At its best it has a diameter of six to seven feet and a height of 175 to 200 feet. Its bole is cylindrical and clear for about one-half its length and is surmounted by a conical crown, which in old age flattens out. Occasional trees reach an age of 500 years, but the average does not usually exceed 300 years.

Western yellow pine occurs on a variety of soils and slopes within its range. It is most abundant on north slopes, however, and reaches its best development on the west flanks of the Sierras, and especially on the plateau region about Mount Shasta. In the latter region it forms 80 to 90 per cent of the stand, and exceptional areas yield as much as 150,000 feet B. M. Southward in the Sierras the development of the individual tree is often as good, but the proportion of western yellow pine in the stand is apt to be less, and the yield per acre consequently not so large.

Western yellow pine is a prolific seeder, and the seedlings do well in all situations that have abundant sunlight. They will not endure much shade, however, and for this reason trees of the species are less numerous on northern slopes than on slopes with south, east or west exposure. The need of western yellow pine for sunlight is responsible for the cleanness of its bole. When shaded, the lower portion of the crown dies and the upper portion makes up for the loss in leaf surface by striving higher toward the light.

At the age of 100 years western yellow pine will reach, on the average, a diameter of 20 inches, and a height of 94 feet. Calculations made on a favorable situation near Mount Shasta containing an average of 500 saplings to the acre, 4 inches in diameter and 14 years old, demonstrated that at the end of 40 years there would be produced 120 trees to the acre, 16 inches in diameter, or 20,000 board feet per acre.

Satisfactory reproduction of western yellow pine can be secured after lumbering without much difficulty by leaving a few seed trees per acre, and by preparing the seed bed by burning the slash at the proper season. In the ordinary course of lumbering enough small trees are left to seed up the area, but too often these trees are destroyed by fire, and their places taken by brush in which it is difficult for young trees to gain a foothold.

Jeffrey pine (Pinus jeffreyi).

Jeffrey pine is very closely allied to western yellow pine with which it commonly occurs at the higher elevations. In its typical form it is found at elevations of 6000 to 9000 feet. It is much more common than western yellow pine on the east slope of the Sierras where it forms park-like, flat-topped stands. In its best situations Jeffrey pine reaches a height of 175 feet and a diameter of 5 feet, but in the Alpine zone where severe conditions for development exist, it rarely exceeds 50 feet in height or 3 feet in diameter. Its clear bole in such situations becomes very short and its large crown consists of stout branches.

Jeffrey pine grows on all situations and on all soils, or even in crevices between the rocks where soil appears to be absent. In the Alpine zone it occasionally forms patches of pure forest, but more often it is mixed with California red fir, white fir, lodgepole pine and other species found in this zone. It reproduces well and the seedlings grow rapidly, which are good indications that it will always form an important part of the forest at the higher elevations in the Sierras.

Sugar pine (Pinus lambertiana).

Sugar pine is the most valuable commercial tree on the Pacific Coast, due to the excellent qualities of the wood and the amount of high-class lumber that can be obtained from it for finishing and remanufacturing purposes. It attains its greatest development in the main timber belt of the Sierra Nevadas where it reaches an average maximum height of 175 feet and a corresponding diameter of 4½ feet. The largest trees found are 240 feet in height and 11 feet in diameter, making the sugar pine the largest pine in the world.

About three-fourths of the total stand of sugar pine is found in the Sierra Nevadas, the best stand being along the west slope in the central Sierra region. It rarely occurs in pure stands over an acre in extent, its associates being western yellow pine, white fir, incense cedar and Douglas fir at the lower elevations and California red fir and Jeffrey pine at the higher elevations. The altitudinal range of sugar pine is from 3000 to 6000 feet on the northern Sierras and from 5000 to 9000 feet on the southern Sierras. It forms about 15 per cent of the stand in the region of its best development.

Sugar pine is decidedly intolerant of shade, and yet the seedlings require a moderately moist seedbed in which to sprout. The requirements of abundant sunlight and moist, deep soil make the reproduction of this species an uncertain matter, since other species with which it is associated are not so particular and tend to crowd it out. Except under the best conditions of soil, moisture and shade, sugar pine reproduction is very sparse, and even where conditions are favorable young growth may not be abundant because of the small production of seed and the avidity with which birds and rodents consume it.

The place that sugar pine will occupy in the future forest is problematical. It forms but a small percentage of the stand, and is associated with numerous species, any one of which, under natural conditions, has a better chance of reproducing. Its chance of reproducing itself is still further reduced by the way it is logged. On account of its value, sugar pine is cut more closely than other trees. The proportionate number of seed trees of western yellow pine, white fir and incense cedar is thus increased, and since these have the advantage of being more adaptive, they will eventually crowd out the sugar pine, except from those small and scattered areas where it forms a majority of the stand.

Lodgepole pine (Pinus contorta).

Lodgepole pine, commonly known as Tamarac pine, is a symmetrical tree seldom exceeding 125 feet in height, or 3½ feet in diameter. As a rule it is short and scrubby with an average diameter of from one to two feet. It is a very common tree in the Alpine zone, being found throughout the Sierra Nevadas between 5000 and 7000 feet in the north and 7000 to 11,000 feet in the central and southern parts.

Lodgepole grows well on all soils, but is especially characteristic of swampy mountain meadows where it often forms pure stands, often of great density, but usually open and parklike. Elsewhere it is a constituent of the mixed Alpine forest, in which California red fir predominates.

The reproduction of lodgepole is very abundant. Any soil seems to be good enough for seedlings, and having once gotten a foothold they grow rapidly. This species is not cut for lumber in California, as in the Rocky Mountains, but finds a limited use for mine timber, ties, poles and fuel. As the more valuable pines are cut, it is probable that it will have some commercial importance in this state for lumber.

Knobcone pine (Pinus attenuata).

Knobcone pine is a very scrubby tree rarely exceeding 90 feet in height or a foot in diameter. It is generally found in patches on poor and barren sites, from the Siskiyou Mountains in the north to the San Bernardino Mountains in the south, at elevations varying from 2000 to 4000 feet.

Knobcone pine has no value for lumber, but is an important species since it thrives on the poorest of soils, and reproduces well after fires. The cones persist for 15 to 25 years, and often do not open except through the heat of a forest fire. With exposure to heat they open readily and the seed is sown over an area which otherwise might come up to brush. Jepson calls this species a fire-type pine, which is a type remarkably adapted to a fire-stricken country. The seeds are sown in the ashy soil at the most advantageous time and as a result young stands of knobcone pine are often very dense and uniform.

Digger pine (Pinus sabiniana).

Digger pine grows in the dry foothills, reaching its best development on the western slopes of the middle Sierras between 1,000 and 2,000 feet elevation. Here it reaches a height of 80 feet and a diameter of 3 feet, although it commonly is 40 to 50 feet high and 2 feet in diameter. It branches close to the ground, which renders it unfit for lumber. It is a prolific seeder, but reproduction is usually poor except at the upper limits of its distribution, where it occasionally forms pure stands of limited areas. The edible seeds are used for food by Indians to some extent.

Bishop pine (Pinus muricata).

Bishop pine ranges along the coast from central Mendocino County southward to San Luis Obispo County, reaching its best development in swampy, sheltered locations, where it forms pure stands of trees from 40 to 80 feet high and 1 to 3 feet in diameter. The name is derived from the resemblance of the thickened scale tips on the cones to a bishop's cap.

This species is a fire-type pine, since the cones are persistent and open under the influence of heat. The young stands on the Point Reyes Peninsula show even-aged groves which date their origin from favorable times of seeding. Trees growing in exposed situations are short and deformed after the manner of other species subject to strong wind.

Monterey pine (Pinus radiata).

Monterey pine is confined to a narrow belt a few miles on the California coast, from Pescadero to the shore of San Simeon Bay, and to Santa Rosa, Santa Cruz and Guadalupe islands. It is a remnant of a great forest which existed in times past, but which has been largely destroyed by earth movements on the California coast. Other coast species like Bishop pine, Monterey cypress and Torrey pine owe their localized distribution to this cause.

The best development of Monterey pine is found on the southern shores of Monterey Bay, where it becomes a tree 100 feet high and 2 to 3 feet in diameter. It forms pure, fairly dense stands and grows very rapidly. It has been planted in many parts of the world, and in most cases adapts itself remarkably well to its environment.

Torrey pine (Pinus torreyana).

Torrey pine occurs only on a small area on the coast at Del Mar near San Diego and on Santa Rosa Island. Its usual height is about 40 feet and its diameter 1 foot. In situations exposed to strong sea winds it is shorter and the crown sprawls to leeward. The crown is large and the bole short and stout. This species has no commercial importance and is chiefly interesting because of its extremely restricted habitat.

Western white pine (Pinus monticola).

Western white pine is found in the Alpine zone in the Sierra Nevada Mountains at elevations ranging from 5,500 to 10,000 feet. It rarely exceeds 125 feet in height or 4 feet in diameter. It is commonly associated with California red fir and western hemlock. This species is one of the principal lumber trees in Idaho and Montana, but is cut very little for that purpose in California because of its limited occurrence and the elevation at which it grows.

White-bark pine (Pinus albicaulis).

White-bark pine grows at timber line on the Sierra Nevada Mountains at elevations ranging from 7,000 to 12,000 feet. Because of the exposed situations on which it grows it is usually prostrate in form, or with several main stems 8 or 10 feet high arising from the base.

Other pines found in California.

Limber pine (*Pinus flexilis*). Occurs at high elevations on the desert ranges of southern California, where it is a short, scrubby tree.

Foxtail pine (*Pinus balfouriana*). Grows on high slopes at high elevations in a few localized areas in the Sierra Nevadas.

Big-cone pine (*Pinus coulteri*). A tree growing on dry mountain slopes at elevations ranging from 2,500 to 6,000 feet. It is chiefly found in the southern coast mountains and has no commercial importance because of its limited occurrence.

One-leaf Piñon (*Pinus monophylla*). This pine is commonly known as the nut pine. Its seeds are highly prized by the Indians for food. It occurs chiefly in Nevada, but is found as a short tree 20 to 40 feet high in a few elevations on the west slope of the Sierra Nevadas.

Parry Piñon (*Pinus parryana*). A short-timbered tree which occurs to a limited extent on the dry mountains of southern California.

Redwood (Sequoia sempervirens).

Redwood is a massive tree, specimens 350 feet high and 20 feet in diameter having been measured, and the age computed at 1300 years, and over. The average dimensions of the trees logged are from 200 to 275 feet in height and from 3 to 10 feet in diameter. Under normal conditions of growth, redwood develops a long cylindrical bole, clean for two-thirds of its length, and surmounted by a narrow, tapering crown. Its occurrence and development within its range are governed by soil moisture. It does best on deep, well-drained soil, with plenty of humus. The trees on the slopes are smaller, and on upper slopes with south or southwest exposure the species may be entirely absent. In early life redwood grows rapidly in height and diameter. Later, the growth falls off, and in old age is extremely slow. Measurements have been taken on old redwoods which increased only 6 inches in diameter in the last 300 years.

Redwood rarely reproduces by seed, a very large proportion of the stand originating from stump sprouts and suckers from the roots. Very few conifers reproduce in this way, redwood being the most conspicuous example. The sprouts grow rapidly when given plenty of light, compete with one another, and in the end the strongest form a circle of trees around the parent stump. Cases have been noted where a third circle still further out has been formed when the second-growth circle has been removed. By this time all evidence of the parent tree may have disappeared, with only a ring of enormous progeny to show that it ever existed.

The vitality of redwood is remarkable. It not only lives to a great age, but after being cut it sprouts repeatedly, drawing on the nourishment stored in its enormous roots. Abundant sunlight is necessary to induce rapid growth, but a tree after being suppressed for years will recover after the shade has been removed. Redwood can not endure lack of moisture, however, and the fact that many of the oldest and tallest trees are spike-topped may be due to the sensitiveness of the tree to drought. Most of the winds that reach the redwoods are moist, but it is probable that there have been drying winds at times during the life of the tree with enough severity to kill the topmost branches.

Redwood has few enemies and is well protected against them. The thickness of the bark serves to protect it against any but the hottest of fires. The popular idea that redwood will not burn, however, was proven erroneous this summer, when a very severe fire in Humboldt County burned down trees from two to four feet in diameter. Insects and fungi do very little harm to redwood, the wood of which seems to have more or less immunity against these destructive agencies.

Relative to its weight, redwood is one of the strongest woods known. It is not especially elastic and, consequently, is not extensively used for structural purposes where timbers are subject to heavy loads. The wood is sufficiently strong and stiff, however, for general house construction purposes, and in addition, is light and durable. These properties, as well as its ability to keep its shape, makes redwood an excellent wood for silos, tanks and woodpipe. Redwood makes a good shingle wood because of its durability and the slowness with which it burns. It makes a beautiful interior finish and is finding a constantly increasing market for this purpose throughout the Eastern States.

"THE REDWOOD."

(*Sequoia sempervirens.*)

By C. W. McCann, Secretary, California Redwood Association.

It is conceded that the California redwoods are the oldest living things on earth, and visitors from all over the world have come to see and marvel at the redwood forests. Our visitors have been inspired by the grandeur of the giant redwoods, and in consequence have told their friends of these wonders. The benefit to California is obvious, since redwood is found no other place in the world, with the exception of a small acreage in Oregon, near the California line.

The Californian is proud of California and its natural resources, but aside from the scenic wonders of the redwoods, many Californians even are not possessed of information as to the part the redwoods have played in the industrial and agricultural developments of their state, the United States and foreign countries. Neither do they realize the assistance given the government and its allies in their war programs.

Redwood, besides being a strong competitive wood for general construction purposes, is recognized as a specialty wood, by reason of its peculiar physical and mechanical properties, particularly its resistance to fire and rot and the ease with which it can be worked, also the practically total absence of shrinkage and warping when properly seasoned.

At present there are 22 redwood mill operators, employing thousands of people in the production and distribution of redwood lumber and by-products. At the present rate of production enough privately-owned redwood for commercial uses remains to keep the mills running for over one hundred years.

During 1917 the 16 mills affiliated with the California Redwood Association produced 374,000,000 feet, board measure, of redwood. The same mills shipped 318,006,000 feet, board measure.

The Redwood Emergency Bureau, with headquarters in San Francisco, and organized for the purpose as outlined in their articles of organization, viz:

> "To assist the war program of the United States government by placing at the disposal of the government the co-ordinated stocks of redwood, and the facilities for manufacturing same, of the different units of the Emergency Bureau,"

has supplied the United States government and its allies over 34,000,000 feet, board measure, redwood during the last year.

The California Redwood Association was organized and is maintained by sixteen of the principal redwood manufacturers for the purpose of exploiting redwood lumber and by-products; to collect and disseminate statistics and information of interest to the industry and to the consumer. It is engaged in a national publicity campaign of an educational nature: Its engineering department has been active in the promotion of redwood in wood-block flooring construction and as an evidence of the interest evinced by architects and engineers there has been—during the ten months ending October 31, 1918—1,053,000 feet, board measure, redwood supplied for wood block flooring construction in some of the principal shipbuilding and industrial plants on the Pacific coast. Jobs are pending for which the contracts have been let requiring 779,000 feet, board measure, redwood and there is at present an active prospect for a large industrial plant on the Atlantic coast for similar construction which will require 6,000,000 feet, board measure, redwood.

"Think you 'tis 'wrong' to fell such majesty?
Then is it wrong to dig the coal of earth?
  If reverently done, for weal of man,
The death of trees becomes another birth;
A birth of use, of service—with a beauty,
Distinct in kind, yet of a broader worth."

Bigtree (Sequoia gigantea).

Bigtree is a close relative of redwood, but grows under entirely different conditions. It is found on the western slope of the Sierra Nevadas at elevations ranging from 5000 to 8000 feet on a variety of soils, while its cousin redwood is found only on a narrow humid belt along the coast. Redwood grows in a more or less continuous belt throughout its range, whereas bigtree occurs in a series of thirty-two groves extending from Placer County southward to Tulare County. These groves contain all the way from 6000 to 20,000 trees, the Giant Forest in Tulare County being the largest and the North Grove in Placer County the smallest.

Bigtree is the largest and oldest tree in the world. Some of the largest trees are the General Sherman, which is 280 feet high with a diameter of 36½ feet. The General Grant tree is 264 feet high and 35 feet in diameter, and the Abraham Lincoln tree 270 feet high with a diameter of 31 feet.

In regard to the size and age of this remarkable tree, Ellsworth Huntington made the following comments in *Harper's Magazine:*

> "Three thousand fence posts, sufficient to support a wire fence around 8000 or 9000 acres, have been made from one of these giants, and that was only the first step toward using its huge carcass. Six hundred and fifty thousand shingles, enough to cover the roofs of seventy or eighty houses, formed the second item of its product. Finally there still remained hundreds of cords of firewood which no one could use because of the prohibitive expense of hauling the wood out of the mountains. The upper third of the trunk and all the branches lie on the ground where they fell, not visibly rotting, for the wood is wonderfully enduring, but simply waiting till some foolish camper shall light a devastating fire.
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> "Huge as the sequoias are, their size is scarcely so wonderful as their age. A tree that has lived 500 years is still in its early youth; one that has rounded out 1000 summers and winters is only in full maturity; and old age, the three-score years and ten of the sequoias, does not come for seventeen or eighteen centuries.
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> "How old the oldest trees may be is not yet certain, but I have counted the rings of seventy-nine that were over 2000 years of age, of three that were over 3000, and of one that was 3150.
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> "In the days of the Trojan War and of the exodus of the Hebrews from Egypt this oldest tree was a sturdy sapling, with stiff, prickly foliage like that of a cedar, but far more compressed. It was doubtless a graceful, sharply conical tree, twenty or thirty feet high, with dense, horizontal branches, the lower ones of which swept the ground. Like the young trees of today, the ancient sequoia and the clump of trees of similar age which grew close to it must have been a charming adornment of the landscape. By the time of Marathon the trees had lost the hard, sharp lines of youth, and were thoroughly mature. The lower branches had disappeared, up to a height of a hundred feet or more; the giant

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> "How old the oldest trees may be is not yet certain, but I have counted the rings of seventy-nine that were over 2000 years of age, of three that were over 3000, and of one that was 3150.
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> "In the days of the Trojan War and of the exodus of the Hebrews from Egypt this oldest tree was a sturdy sapling, with stiff, prickly foliage like that of a cedar, but far more compressed. It was doubtless a graceful, sharply conical tree, twenty or thirty feet high, with dense, horizontal branches, the lower ones of which swept the ground. Like the young trees of today, the ancient sequoia and the clump of trees of similar age which grew close to it must have been a charming adornment of the landscape. By the time of Marathon the trees had lost the hard, sharp lines of youth, and were thoroughly mature. The lower branches had disappeared, up to a height of a hundred feet or more; the giant

> trunks were disclosed as bare, reddish columns covered with soft bark six inches or a foot in thickness; the upper branches had acquired a slightly drooping aspect; and the spiny foliage, far removed from the ground, had assumed a graceful, rounded appearance. Then for centuries, through the days of Rome, the Dark Ages, and all the period of the growth of European civilization, the ancient giants preserved the same appearance, strong and solid, but with a strangely attractive, approachable quality."

Incense cedar (Libocedrus decurrens).

Incense cedar is a tree chiefly found on the west slope of the Sierra Nevadas where it forms about 8 per cent of a mixture of yellow pine, sugar pine, white fir and Douglas fir. It is found growing under many conditions at elevations ranging from 2000 to 5000 feet in the north and from 3000 to 7000 feet in the south. The average height is from 75 to 110 feet and the average diameter from 30 to 40 inches. The largest trees are 150 feet in height and 96 inches in diameter. The species is long-lived and it is not uncommon for trees to be from 300 to 500 years old.

Incense cedar is short-bodied and tapers rapidly. The mature trees are swell-butted and have bark from 6 to 8 inches thick. Old trees have long and straggling crowns and the whole appearance suggests the unsoundness which is very common to the species. Dry-rot fungus attacks the heartwood by spores which enter through fire scars and branch stubs. Cavities are caused which are filled by a dry, brown substance which gives the name of "dry-rot" so characteristic of this species.

If it were not for the great reproductive ability, incense cedar would have a hard time competing with the species with which it associates. The seedlings endure considerable shade, and grow rapidly especially where moisture conditions are good. In older life more light is required and it competes for a place with the faster growing pines and the more tolerant fir with which it is associated.

Little incense cedar is on the general market in the form of lumber; although it has an extensive local use for posts, poles and shingles. Recently several pencil factories have been established in California, which are using this wood for pencil slats for which it is largely supplanting southern red cedar which is rapidly becoming exhausted.

Western red cedar (Thuja plicata).

Western red cedar, commonly called canoe cedar, has a very limited range in California. It occurs as scattered individuals from Mendocino County northward along the coast, extending inland along canyons to the slopes of the Siskiyous. In Washington and Oregon it reaches a height of 200 feet and a diameter of 15 feet, but in California the trees are much smaller. The wood is very durable and because of its extensive use for shingles and siding is advertised under the name of "America's overcoat wood."

Port Orford cedar (Chamæcyparis lawsoniana).

Port Orford cedar, or Lawson cypress as it is known to gardeners, inhabits scattered localities along the coast and mountain streams in northern California. It reaches its best development in the Coos Bay region of Oregon where it reaches a height of 175 to 200 feet and a diameter of 6 to 12 feet.

The wood, which has a distinctive odor, is white, strong, durable and easily worked. It is being extensively used by the government for aeroplane, boat and dock material, for which its many admirable qualities especially fit it.

Douglas fir (Pseudotsuga taxifolia).

Douglas fir, known by the market name of Oregon pine, embodies the requirements of a good building wood, inasmuch as it has strength, stiffness, medium weight and is easy to handle and work. Because of these qualities, and especially its strength, which is not exceeded by any wood of its weight in this country, it is the chief wood used on the Pacific coast for structural purposes. It has great importance at the present time for shipbuilding because of the large size of timbers that can be obtained.

The region of maximum development of Douglas fir, is on the west slopes of the Cascades in Washington and Oregon, where cool, moist situations exist. In California it is found from sea level to 4000 feet along the north coast and from 3000 to 5000 feet in the Sierra Nevadas as far south as the vicinity of Mount Whitney. It becomes of less importance from north to south and is finally replaced on the southern Coast Ranges by its relative, the big-cone spruce.

In the coast zone Douglas fir associates with redwood and is sometimes found in pure stands. In the Sierras its associates are sugar pine, western yellow pine, white fir and incense cedar, and the development is much inferior to that on the coast where trees 200 feet in height and 8 feet in diameter are common.

Along the coast, and in the northern Sierras, Douglas fir will probably form an important part of the future forest. In eastern Humboldt County it is reclaiming large areas of open land where fires have been kept out; and in the northern Sierras reproduction generally follows logging. Southward, reproduction does not come in so well, and the representation of Douglas fir in the stand is sparce except on moist situations on well drained, loamy soil.

Big-Cone spruce (Pseudotsuga macrocarpa).

Big-cone spruce is a near relative of Douglas fir which it replaces in the coast ranges south of Santa Barbara. It grows in sheltered spots at elevations ranging from 3000 to 5000 feet, usually in small groves. Average mature trees are 3 to 4 feet in diameter and about 60 feet in height, although occasional trees are 90 feet tall. The wood is of little commercial importance being much inferior to that of Douglas fir.

White fir (Abies concolor).

White fir is found in the mountain zone throughout the state, except in the Santa Lucia Mountains where it is replaced by a close relative, the Santa Lucia fir. It is one of the most abundant trees in the main timber belt of the Sierra Nevadas where it grows between 2500 and 7500 feet at the north and 5000 to 8000 feet at the south.

At its best white fir grows in dense stands in which the soil is so shaded that undergrowth is prevented from developing. It is tall and slender, reaching a height of 175 to 200 feet and a diameter of 3 to 6 feet. At high altitudes its average height is about 80 feet.

Reproduction of white fir is very good on account of its ability to endure shade. In favorable spots in the northern Sierras, the proportion of white fir in the reproduction is often as high as 80 to 90 per cent. It is logged much less closely than pine which gives it an advantage. The young trees are very sensitive to fire, however, and promising reproduction is often destroyed by it. When this is the case, chaparral usually occupies the ground making it extremely difficult for trees to again reoccupy the ground.

White fir lumber serves for cheap and temporary construction purposes, but it is not satisfactory where strength and durability are needed. Because of its tendency to split when nailed, it has but a limited use in the manufacture of fruit boxes, which are chiefly made of pine. Some lumber companies do not cut white fir because of the difficulty of disposing of the lumber at a profit. It is a good pulp wood, however, and will be increasingly used for that purpose in this state.

California Red fir (Abies magnifica).

California red fir is the principal timber species in the Alpine zone, often forming pure stands of great beauty. It occurs chiefly on the west slope of the Sierra Nevadas at elevations ranging from 5000 in the north to 8000 feet in the south. In the region of its best development this tree forms a straight, cylindrical bole averaging 2 to 3½ feet in diameter and 100 to 140 feet in height. Occasional trees attain a height of 175 feet and a diameter of 5 feet. At the higher elevations and on exposed situations, the boles are very tapering and the crowns comparatively larger.

A noticeable characteristic of California red fir is the curvature of the bole near the ground, caused by the weight of snow bending the seedlings. After the bole becomes stouter and stiffer it is able to support the snow without bending under it, and the trees grows straight thereafter, but the deformity acquired in its early years is permanent.

California red fir reproduces well and tends to form even-aged groups of seedlings in openings. The young trees are susceptible to fire, because of their thin bark and inflammable foliage. Later in life the bark becomes thick and offers more resistance.

Shasta fir is a form of this species with a slight botanical difference, which is found chiefly in the vicinity of Mount Shasta.

Lowland fir (Abies grandis).

Lowland fir extends along the coast from Sonoma County northward into Oregon and Washington. It grows best on moist situations occurring as scattered trees among the redwoods to a distance of fifteen or twenty miles from the coast. It becomes a large tree with a straight, cylindrical bole 150 to 200 feet in height and 3 to 4 feet in diameter, but is of little value for lumber because of its softness and lack of durability.

Santa Lucia fir (Abies venusta).

Santa Lucia fir, a small tree confined to the Santa Lucia Mountains, is remarkable for its peculiar bristly cones which cause it to be commonly known as ''bristle-cone fir,'' and its localized distribution. It has no commercial importance, but from a botanical standpoint it is one of the most interesting species in California.

Noble fir (Abies nobilis).

Noble fir is an important timber tree along the coast in Washington and Oregon, but is found only as scattered individuals in the Trinity Mountains of northern California, which is the southern limit of its distribution.

Sitka spruce (Picea sitchensis).

Sitka spruce, also known as tideland spruce, which is of so great importance for aeroplane material because of its strength, elasticity, straight grain and comparative freedom from hidden defects, occurs to a limited extent in California along the coast north of Mendocino County. The tree seldom exceeds 100 feet in height or 4 feet in diameter in California, but in Oregon and Washington it reacher large proportions. It was logged in these states by the government through ''spruce regiments,'' and it furnished the Allies the material with which they gained the victory of the air.

Weeping spruce (Picea breweriana).

Weeping spruce, sometimes called Brewer's spruce, grows at elevations of 6000 to 8000 feet in a few localities in northwestern California on cool, moist slopes. It is a small tree of striking appearance, but has no commercial importance.

Western hemlock (Tsuga heterophylla).

Western hemlock is an inhabitant of flats near the coast from Sonoma County northward. South of Humboldt County it is rare and nowhere in the state is it commercially important. The heaviest stands occur in Washington and Oregon where hemlock reaches a height of 200 feet and a diameter of 6 feet. There it is an important source of lumber, being much superior to its eastern relative. It is sometimes sold under the name of "silver fir," and serves well for rough construction since it is fairly strong, tough, close-grained and holds nails well. It is not a durable wood, however, and should not be placed in contact with the ground.

Mountain hemlock (Tsuga mertensiana).

Mountain hemlock is a timber-line tree in the Sierra Nevadas where it often forms pure stands in sheltered locations. It is found as a small, graceful tree at elevations ranging from 8000 to 11,000 feet. Its chief associates at the lower part of the range are California red fir, lodgepole pine and mountain white pine. Unlike its cousin, the coast hemlock, it is rarely cut for lumber, its chief value being for holding snow, and thus regulating the flow of mountain streams.

Monterey cypress (Cupressus macrocarpa).

Monterey cypress, in common with Monterey pine, has an extremely restricted local distribution. It occupies an area south of Monterey Bay about two miles long and 200 yards wide from Cypress Point to the shores of Carmel Bay, with a small grove at Point Lobos. It becomes a tree of 70 feet high and 3 feet in diameter, and is extremely picturesque along the ocean where it is exposed to heavy wind which causes it to assume irregular shapes. Monterey cypress has no value for lumber but is successfully used in California for windbreaks and hedges.

There are several other species of cypress peculiar to California which are described by Professor W. L. Jepson in his book "The Trees of California." They are Gowen cypress (*Cupressus goveniana*), a small tree with a limited distribution on the Mendocino coast and at Monterey, Sargent cypress (*Cupressus sargentii*), scarcely more than a shrub which occurs in the mountains of Mendocino County southward to the Santa Lucia Mountains, MacNab cypress (*Cupressus macnabiana*), a small bushy tree which inhabits the dry, northern Sierra foothills and

Modoc cypress (*Cupressus bakeri*), a small tree reaching 25 feet in height, found in the lava beds of southwestern Siskiyou and southwestern Modoc counties.

Junipers.

California juniper (*Juniperus californica*) is generally a bushy shrub, but often grows to be a tree 25 feet in height. It is found on arid situations on the east slope of the Sierras in southern California and in the Coast Range as far north as Lake County.

Desert juniper (*Juniperus utahensis*) occurs as a stunted tree not over 20 feet high in the desert ranges east of the Sierra Nevadas. It is locally used by settlers for fence posts and fuel.

Sierra juniper (*Juniperus occidentalis*) reaches its best development in the Sierra Nevadas, where it is often 65 feet high and 5 feet in diameter. It occurs at timber line at altitudes ranging from 7000 to 10,500 feet, where it is of irregular shape due to its exposed location.

Western yew (Taxus brevifolia).

Western yew, although widely distributed along the coast and in the mountains as far south as the southern Sierras, is of comparatively rare occurrence. It seldom exceeds 40 feet in height and 1 to 1½ feet in diameter, its best development being in moist, cool canyons. The wood is very hard, durable and close-grained and is used locally for posts, tool handles and wedges.

California nutmeg (Tumion californicum).

California nutmeg derives its name from its fruit which resembles the numeg. It has much the same range as the yew and prefers the same conditions. In the northern coast canyons it sometimes becomes a tree 50 feet high, but is ordinarily shrub-like in character.

BROAD-LEAVED TREES.

Valley oak (Quercus lobata).

Valley oak reaches its best development in the deep soil of the upper Sacramento where it reaches a height of 150 feet and a diameter of 6 to 8 feet. Towards the north it ascends from the valley to 1500 feet where it mingles with blue oak and digger pine. Near the southern limits of its range north of Soledad Pass it is found at an elevation of 4500 feet.

Valley oak is the largest of the white oaks in California, but is very little used for saw timber on account of the inferiority of the wood to the Eastern and imported oak. It is used for firewood, being called "mush oak" by dealers to distinguish it from the mountain white oak which has a much higher fuel value. The chief value of the tree is for ornamental purposes, and it is to be regretted that it is necessary to sacrifice so many of these noble trees to make room for agricultural development.

Mountain white oak (Quercus douglasii).

Mountain white oak, also called blue oak or rock oak, ranges between 200 and 1500 feet at the head of the Sacramento Valley and ascends to about 4000 feet in the southern Sierras. It is an associate of digger pine and live oak, and reaches a height of 90 feet and a diameter of 4 feet in the best localities. The average size of this tree is much smaller, being about 60 feet in height and 2 feet in diameter. The wood is dense and hard and is widely used in valley towns for fuel in place of coal, the supply of which is limited because of war needs.

California black oak (Quercus californica).

California black oak is found at middle elevations. In the Sierra Nevadas it mingles with western yellow pine at elevations ranging from 1500 to 3000 feet in the north and from 4000 to 6000 feet in the south. The distribution is scattering on the coast range where the most common associates are tan oak and madrona.

Black oak reaches a height of 40 to 50 feet and a diameter of 2 to 4 feet. It grows well in the sunlight, but will not endure shade. Young seedlings sprout repeatedly after being burned and if fires do not follow each other with too great frequency, the sprouts serve as nurses for the more valuable species. The old trees are easily wind-thrown. They have no value for lumber, but furnish fuel of good quality.

Post oak (Quercus garryana).

Post oak, often called Oregon oak, because of its common occurrence in that state, occurs most abundantly in California in the coast ranges. In the north coast ranges it associates with Douglas fir, tan oak and madrona, reaching a height of 50 feet and a diameter of 2 to 3 feet. The wood is hard and strong and has a wide local use for posts and fuel.

Maul oak (Quercus chrysolepis).

Maul oak, so-called because of the toughness of the grain which permits it to be used for mauls, is a live oak which is widely distributed throughout the state. It reaches its best development in cool, moist canyons where it attains a height of 60 feet and a diameter of 3 to 5 feet. It occurs at elevations ranging from 1500 to 8000 feet, being a small scrubby tree at the latter elevation. The wood is highly prized as fuel and brings the highest price of any fuel wood on the California market.

Coast live oak (Quercus agrifolia).

Coast live oak is found on the coast ranges from northern Sonoma County to southern California. It is sometimes 70 feet high, but does not average over 30 to 40 feet in height or 3 to 4 feet in diameter. It grows on a variety of soils, and its broad-headed crown is a common sight on the hills and valleys of the coast range. The wood is heavy and hard, and is used for fuel and wagon parts by ranchers.

Interior live oak (Quercus wislizenii).

Interior live oak is widely distributed through the Sacramento and San Joaquin valleys, and extends into the Sierra Nevada foothills to elevations several thousand feet in height. It does best on fertile soil along rivers, becoming shrublike in form on barren soils. The wood is tough and strong and has a high value for firewood.

Other California oaks.

Mesa oak (*Quercus engelmanii*), often called evergreen oak, is a small tree inhabiting the low hills of southwestern California west of the coast range.

Island oak (*Quercus tomentella*) is a very rare species, found only on Santa Cruz, Santa Rosa, San Clemente and Santa Catalina Islands.

Deer oak (*Quercus sadleriana*) is found only at high elevations in the mountains of northern California where it is scarcely more than a shrub.

Tan Oak (Pasania densiflora).

Tan oak, which is equally related to the chestnuts and oaks is a large tree, 125 to 150 feet high, which is chiefly found in the coast ranges where it has high value because of the bark which is used for tanning purposes. In the Sierra Nevadas it rarely exceeds 30 feet in height, and is of limited occurrence. Tan oak reaches its best development in Humboldt and Mendocino counties where it grows with redwood and Douglas fir on the coast, and with black oak and madrona in the interior. The wood has high fuel value but is little used because of the difficulty in getting it out from the remote places where bark camps are located.

Chinquapin (Castanopsis chrysophylla).

Chinquapin, which is also related to the chestnut, reaches its best development in moist, cool situations with rich, fresh soil along the coast where it becomes a tree 100 feet or more in height and 2 to 4 feet in diameter. In the Sierras it is usually a shrub forming a small proportion of the chaparral, and is conspicuous because of its chestnut-like burs.

California laurel (Umbellularia californica).

California laurel, commonly called pepperwood and bay laurel, occurs throughout the coast ranges and within the foothill zone on the west slopes of the Sierras. It reaches its best development on flats along the large streams in the coast zone, especially in Humboldt and Del Norte counties. Over small areas in these situations it is found in pure stands, but as a rule it associates with redwood, Douglas fir, hemlock, lowland fir, Port Orford cedar, Sitka spruce, tan oak, alder and maple.

In the region of its best development laurel becomes a tree 80 to 100 feet high and 4 to 6 feet in diameter. In the San Gabriel and San Bernardino mountains it follows the streams at the lower elevations, reaching a diameter of 2 feet. When exposed to the wind laurel assumes a chaparral-like form consisting of clumps of slender trees with bushy tops which are conspicuous because of their dark green coloring.

The wood is hard, dense and tough. It is used to some extent for finishing purposes, but its main use is for rollers and wagon stock for which it serves as a good substitute for some of the higher-priced imported woods.

Madrona (Arbutus menziesii).

Madrona is widely distributed in the coast mountains, and occurs on the west slopes of the Sierras, and on the San Bernardino Mountains. In the northern coast zone, where it reaches a height of 125 feet and diameter of 4 feet, it is found on the slopes with redwood, Douglas fir, tan oak and black oak. The tree is of small economic importance, but its beauty of foliage, flowers and trunk are sources of never-failing interest to the traveler.

Alder.

Red alder (*Alnus rubra*) is always found in moist situations, being particularly frequent near springs. In Humboldt and Mendocino counties it forms pure stands, but as a rule it is scattered over its extended range which reaches as far south as the Santa Inez Mountains.

White alder (*Alnus rhombifolia*) grows in the Sierra Nevadas and the ranges in southern California at heights ranging from 2500 at the north to 8000 feet in the south. It frequents streams and becomes shrub-like at the highest elevations. The wood, like that of red alder, is light and coarse and has no economic value.

Maple.

Big-leaf maple (*Acer macrophyllum*), often called Oregon maple, is very generally distributed throughout the coast zone, and in the Sierras and southern mountains occurs along streams at elevations ranging from 2000 to 5000 feet. It is a small tree, rarely attaining a height of over 60 feet or a diameter of 2 feet. The wood is used to some extent for handles and furniture, but is inferior to the Eastern hard maple on account of its lightness and porosity.

Vine maple (*Acer circinatum*) occurs along banks of streams, chiefly in Mendocino and Humboldt counties. It is generally vinelike, but occasionally becomes a tree 20 feet high.

Dwarf maple (*Acer glabrum*) forms thickets in moist localities at elevations from 6000 to 8000 feet in the Sierra Nevadas and North Coast ranges. It is a shrub not over 5 to 10 feet high.

Box elder (*Acer negundo*) inhabits stream bottoms in the Sierra Nevadas, Sacramento and San Joaquin valleys and coast ranges. The trees are scattered, and are rarely over 40 feet high or 2 feet in diameter.

Ashes.

Oregon ash (*Fraxinus oregona*) is a tree 60 to 80 feet high and 2 to 3 feet in diameter. It inhabits stream banks and moist flats throughout the Sierra Nevadas and coast ranges and reaches its best development in the northern part of its range.

Arizona ash (*Fraxinus velutina*) is a tree 15 to 30 feet high, which inhabits banks of streams in scattered localities in southern California.

Leather-leaf ash (*Fraxinus coriacea*) has about the same size as Arizona ash. It is found in the desert regions of southeastern California in the vicinity of Owens Lake and Mount San Jacinto.

Cottonwoods.

Fremont cottonwood (*Populus fremontii*) is distributed chiefly through the Sacramento and San Joaquin valleys where it is common along water courses. It reaches a height of 90 feet and a diameter of 5 feet. It has low fuel value, but is finding an extensive use for box boards and excelsior. The land from which it is removed has high agricultural value as a rule.

Black cottonwood (*Populus trichocarpa*) is found in canyons in the coast ranges and on the slopes of the Sierras, from the northern boundary of the state as far south as the San Bernardino Mountains. It is a moisture-loving tree, and at favorable locations or on flats at the bottoms of broad canyons it reaches a height of 90 feet, and a diameter of 2 to 3 feet.

Aspen (Populus tremuloides).

Aspen is commonly found in the high Sierras where it occurs as a graceful slender tree from 10 to 60 feet high and from 3 to 6 inches in diameter. A characteristic feature of this tree is the leaves which tremble at the slightest breeze.

California black walnut (Juglans californica).

California black walnut is a low branching tree which inhabits stream beds and mountain slopes in southern California. It is rarely over 25 feet high and has a shrublike appearance. It has been introduced in the upper Sacramento Valley, and when planted under favorable conditions, becomes a good-sized tree. The wood of Eastern black walnut is in good demand by the government for gunstock material, and it is probable that the larger trees of the Western species can be utilized for this purpose.

Western sycamore (Platanus racemosa).

Western sycamore is characteristic of stream bottoms in the Sacramento and San Joaquin valleys and in southern California. It is an irregular, widespreading tree reaching 90 feet in height and 5 feet in diameter in favorable locations. The wood is soft and porous and of low heat value compared to oak and eucalyptus.

California buckeye (Aesculus californica).

California buckeye is usually found along watercourses in the coast ranges and Sierra Nevada foothills where it reaches a height of 30 feet and a diameter of 3 feet. The branches are irregular and the tree has a characteristic appearance which makes it easily noticeable in the localities which it frequents.

Other species.

The willows, of which yellow willow (*Salix lasiandra*) and black willow (*Salix nigra*) are the most common, are small trees or shrubs which occur along watercourses throughout the state. Much of the valley land on which they grow is valuable for agricultural purposes, and the wood taken off in clearing is utilized for firewood.

Wild cherry (*Prunus emarginata*) is a shrub or small tree rarely 20 feet high which is found in thickets on dry mountain slopes throughout the state. It attains its largest size near streams. Islay (*Prunus ilicifolia*) is an evergreen shrub or small tree with hollylike leaves, which is found in the coast ranges south from San Francisco Bay to the San Bernardino Mountains.

Catalina ironwood (*Lyonothamnus floribundus*) is a rare species which is confined to four of the Santa Barbara Islands. It is a slender tree, rarely over 50 feet in height, which thrives when removed from its native habitat. It is a tree of great beauty which is being planted in certain sections of the state with considerable success.

DESERT SPECIES.

A number of the most characteristic of the desert trees are palmlike trees which are much different in structure from the coniferous and broad-leaved trees. They are of little importance commercially, but are of considerable botanical interest.

The Joshua tree (*Yucca brevifolia*) forms scattered groves in small places in the deserts of southeastern California. It is fom 20 to 30 feet high with a columnar trunk and armlike branches. The spongy wood is cut into thin layers and finds a limited use for splints and boxes.

Spanish dagger (*Yucca mohavensis*) is a low tree from 10 to 15 feet high which is characteristic of the Mohave Desert although it occurs along the coast as far north as Monterey County.

California fan palm (*Washingtonia filifera*) forms clumps in wet alkali soil in desert regions of southern California. It reaches a height of 75 feet and a diameter of 3 feet. This palm is widely cultivated in southern California on streets and private grounds.

The desert species also embrace a variety of hardwoods which are largely used for fuel. The principal ones belong to the pea family and are as follows:

Mesquite (*Prosopis juliflora*) is a small tree, 15 to 35 feet high with a short trunk which is found in the Mohave Desert and Death Valley. The pods are used for food by the Indians, and the hard, flinty wood is highly prized for fuel by those in the desert regions. Screw bean (*Prosopis pubescens*), often called screw-pod mesquite, is a small tree with spiny branches which is found in the same region as mesquite.

Palo Verde (*Cercidium torreyanum*) is a small tree 15 to 20 feet high which is common in the arid regions of southern California. The trees have bright green bark from which the Spanish derived the name. Its pods are used for food.

Smoke tree (*Dalea spinosa*) derives its name from its deceptive appearance which resembles a column of smoke. It has an ashy-gray appearance, few leaves and is very spinose.

Desert ironwood (*Olneya tesota*) is a small tree 15 to 20 feet high with a short trunk ¼ to 2½ feet in diameter. It is remarkable for its hard and heavy wood which is prized by prospectors for fuel.

WHITE PINE BLISTER RUST.

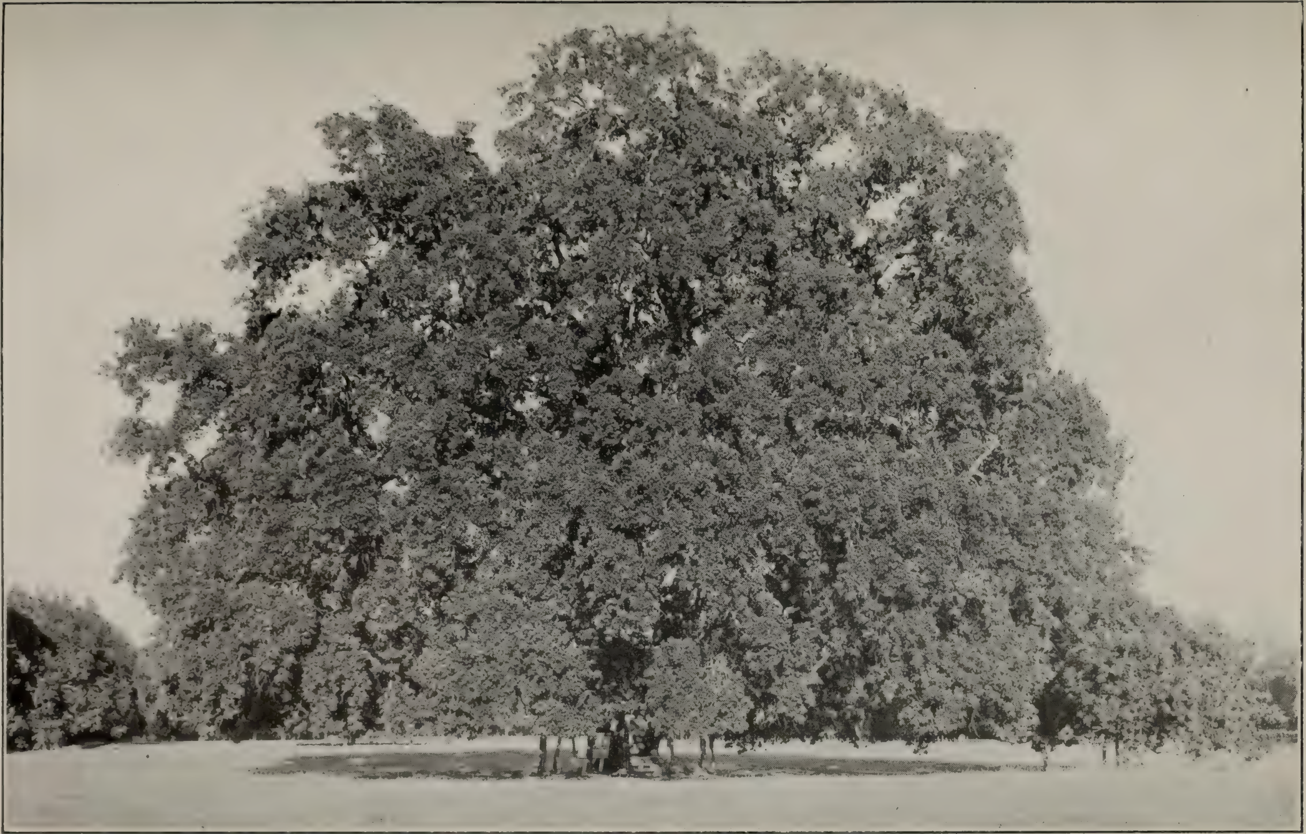
White pine blister rust is caused by a fungus which was brought from Europe on nursery stock. It begins life on the young bark of the five-needled pines and produces blisters there that are filled with dustlike seeds called spores. These spores are blown in May and June to currant and gooseberry leaves and grow into a rust on the under sides of the leaves. After a period of growth on the leaves, another form of seedlike spores are developed and are blown in August and September to healthy pines. The life cycle there begins all over again. Spraying will not check its spread. The only preventive measures are the cutting and burning of diseased pines and the eradication of all currants and gooseberries in infected localities.

This disease has spread to all of the New England states, New York, New Jersey, Pennsylvania, Ohio, Minnesota and Wisconsin, and an active campaign is now under way to control the spread of the disease and save the valuable pines of the East, and to prevent the spread to the extensive forests in the West. That the federal government looks upon this situation as extremely serious may be judged from the fact that the Secretary of Agriculture was authorized to add a special appropriation of $300,000 to the general agricultural appropriation bill for the specific purpose of combating this disease. In addition, a number of Eastern states have made appropriations for fighting it.

White pine blister rust has not reached California, but it is necessary to guard against it since the state has a total of 38 billion feet of white pine valued at over 96 million dollars, which are open to its attacks. The State Forester, as a member of the Interstate Committee for the Suppression of the Pine Blister Rust, attended a conference in Washington, D. C., in January, 1917, which discussed measures for the control of the disease.

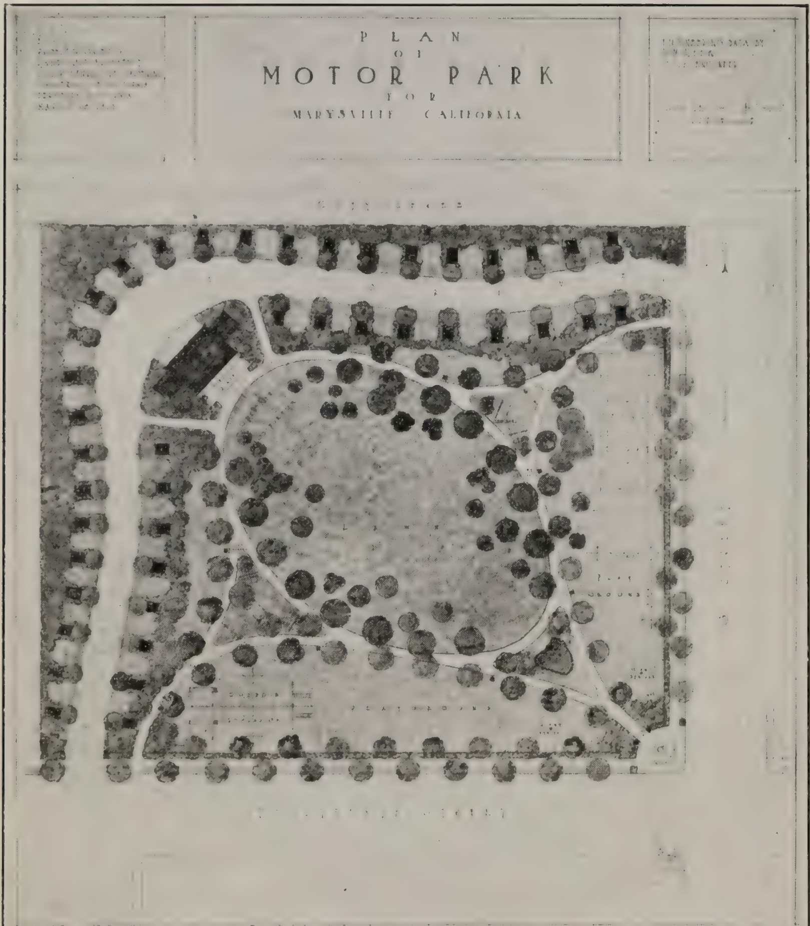
In February, 1917, the State Commissioner of Horticulture of California issued the following order pertaining to white pine blister rust:

> "The fact has been determined by the State Commissioner of Horticulture that a contagious tree disease, known as white pine blister rust (*Peridermium strobi,* Kleb), new to and not heretofore distributed within and throughout the state of California exists in several states of the United States, and that the species and varieties of currants and gooseberries (Ribes) are known to be carriers of this disease.
>
> "*Now therefore*, It is declared necessary, in order to prevent the introduction of white pine blister rust into the pine forests of the state of California, that a horticultural quarantine be and the same is hereby established at the boundaries of the state of California, in accordance with the provisions of section 2319*b* of the Political Code of the state of California, against all five-leafed pine trees, and all species and varieties of currant and gooseberry plants and cuttings, imported or brought from any and all states and districts of the United States east of the Mississippi River, and no such five-leafed pine trees, or currant or gooseberry plants or cuttings shall be permitted to pass over the said quarantine lines so hereby established and proclaimed.
>
> "*Hereafter, and until further notice*, All five-leafed pine trees, and currant and gooseberry plants and cuttings, from any and all states and districts of the United States east of the Mississippi River are denied admittance into the state of California, and upon the arrival of any such trees, plants or cuttings as quarantined against in this order, the same shall be immediately sent out of the state, or destroyed, at the option and expense of the owner or owners, his or their responsible agents. All deputies of the State Commissioner of Horticulture, and state quarantine guardians are hereby empowered to carry out the provisions of this order.
>
> G. H. HECKE,
> State Commissioner of Horticulture.
>
> Approved February 1, 1917.
>
> HIRAM W. JOHNSON,
> Governor of the State of California."



Valley Oak (Quercus lobata). The valley oak, so called because its natural habitat is found in the broad California valleys, is the largest and one of the most beautiful members of the oak family.

(The above illustration shows the "Sir Joseph Hooker Oak" growing in Bidwell Park, about three miles northeast of Chico, California. The oak was named after Sir Joseph Hooker, the famous English naturalist, who was a guest of General Bidwell at his ranch over thirty years ago. The claim is made that it is the largest oak tree in the world. This oak is 105 feet high, with a circumference of the trunk at the ground of 25.7 feet. The spread of the branches from north to south is 200 feet, and the circumference of the outside branches is 446 feet. Allowing two square feet for each person, it is estimated that 7,885 people could stand beneath the branches of this tree.)


PLAN
OF
MOTOR PARK
FOR
MARYSVILLE CALIFORNIA
LAWN
PLAY GROUND

THE AUTOMOBILE CAMPING GROUND A NEW ELEMENT IN PARK DESIGN.

By PROFESSOR J. W. GREGG, Landscape Architect, University of California.

Leading writers and other authorities on modern municipal development are united in the opinion that no town or city can be considered properly equipped without adequate parking facilities. All agree that parks not only add to the beauty of a community and to the pleasure of living in it, but are exceedingly important factors in developing the health, morality, intelligence and business prosperity of its citizens. Indeed it is not too much to say that a liberal provision of such features is one of the surest manifestations of the intelligence and progressiveness of a community. It is therefore constantly becoming more generally and more clearly realized that every resident of a town or city owes to it, in return for benefits and advantages derived from it, certain duties not specifically compulsory according to law, and that among such duties, too often neglected, is that of aiding in every possible way to make the place more beautiful and more agreeable to live and work in, as well as making it more attractive to strangers.

The great war has exerted a disquieting effect on many beneficial civic activities the world over, and is to a certain extent interfering with the progress of American municipalities in doing the things that should be done for their citizens. While it is perfectly justifiable during a period of national stress to distinguish between essential and nonessential activities, it is a shortsighted policy which seeks to stop entirely the development of public parks and recreation centers which have so clearly demonstrated their function of conserving the health, the morals, and the fine spirit of cheerfulness and enthusiasm so vital to the welfare of our citizenship. It has been said that ''the wrongs against society are committed by our people not in their hours of work, but in their hours of leisure,'' and the responsibility lies not wholly with the people who perform these unfortunate acts but with the people who have not been wise enough to see to it that the fundamental business of any community at large is to see that it becomes increasingly easy for people to do right and increasingly hard for them to do wrong. What has been accomplished in the past by the development of parks and recreational facilities is being demonstrated today on the battle fields of France. It is the great American ''playground'' with all its lessons of alertness, quickness of thought and action, physical trim and fair, hard play that is so gloriously competing with the German ''drill ground'' for the supremacy of clean, free thought and right living. It is gratifying to note that many communities have thus far not lost sight of the economic value of parks and recreational areas and are continuing to make it easy for our people to find wholesome, happy and healthful outdoor enjoyment so necessary to the upbuilding of the mental and moral fiber of our citizenship.

From the small level areas providing only an irregular greensward and a miscellaneous tree growth, have been developed the so-called modern park-playgrounds with their numerous features and a more compact, intensive use, all compatible with the increasingly progressive and complex life of the people. Correspondingly, individual local requirements have rapidly broadened to include those of the automobile public where heretofore the designing of the average sized public park has involved the consideration only of those problems and features of direct interest and value to the residents of the community in which it is located.

While many new features or elements, either of utilitarian or æsthetic value in park design and construction, are constantly demanding consideration, probably one of the latest and quite important is the problem involving the wholesome and friendly entertainment of the automobile traveling public. The automobile has without doubt materially changed many of our business methods as well as those which have heretofore governed our mode of living in general, and like all similar important revolutionary factors, it has introduced numerous problems which must necessarily reach a solution before unity and harmony of thought and action can prevail. As a pleasure vehicle the automobile is serving the very important and desirable function of bringing thousands of people into closer and more intimate contact with the open country. It is calling forth that wanderlust and primitive instinct for camp life so inherent in us as a nation of pioneers. So extensive has become this type of traffic that good roads and hotels are not an absolute necessity for those who wish to penetrate the heretofore strictly rural districts. Good roads, however, as they continue to spread in netlike fashion over the state, are important factors in directing and controlling the bulk of automobile traffic. Because of the large amount of such traffic and the fact that an increasingly large number of people are making a practice of camping en route, the numerous beauty spots, which were originally located along our highways and which furnished ideal conditions for temporary camps, are fast being destroyed. The "auto pirate" and the "road hog" are one and the same animal, living off of the "fat of the land," destroying and rendering insanitary all camping spots which they frequent. Roadside thievery, vandalism, and undesirable sanitary conditions are calling to the attention of towns and cities the necessity and desirability of establishing municipal auto parking areas where proper camping facilities can be furnished and maintained in satisfactory condition. Many municipalities in California are now providing such camping sites and their popularity is evidenced by the heavy demands made upon them. That such features are serving a very desirable purpose is without question.

The introduction of the auto camping feature not only adds a new element to park design but many new problems as well, and California towns and cities are meeting the main problem in three different ways: First, by securing a piece of wooded land near the highway outside of the city proper and permitting free camping privileges. Very often in this case there are no conveniences installed by the city and little or no attention is paid to the maintenance of the area. Sometimes rough board tables and seats are built, water piped to the site, and rough toilet facilities provided. Such areas are of course better than nothing, but as a rule they soon become damaged and misused to such an extent that they soon become unattractive to the better class of tourists. Second, some communities which already possess large or medium sized parks, which may be wholly or partly developed, are setting aside a portion of such parks for camp use, and as a rule providing more and better camping facilities. Because such an area is within the park as a whole, it also receives some care and does not therefore become a seriously objectionable feature. Usually, however, such a camping area is located with no regard for the design of the park as a whole, and is consequently a most conspicuous and obtrusive element. Such a feature, like all others in park design, should appear to fit into the general scheme and become a useful as well as ornamental element. Many cities and towns possess parks with undeveloped spaces where with due regard to the principles of landscape design and the proper functioning of elements, most serviceable and pleasing camp sites may be established. If in attempting to locate such an area the design and uses of the park as a whole are not studied, the auto camping ground will prove a conspicuous and oftentimes disagreeable "afterthought." Such camping spaces should be made as attractive as the rest of the park by the use of a reasonable amount of ornamental plantings and the utilization of materials of construction which are similar to those used elsewhere in the park as a whole. Roads and walks should be definitely located, well built and maintained. Proper facilities for cooking should be permanently located in order to prevent campers from building fires wherever their fancy dictates. A good water and sewerage system should be installed and proper bathing and toilet facilities conveniently but not conspicuously located. It is most desirable to extend the lighting system to that portion of the park as well as to install all other features which will in any way aid in making the site convenient, healthy, pleasant and attractive.

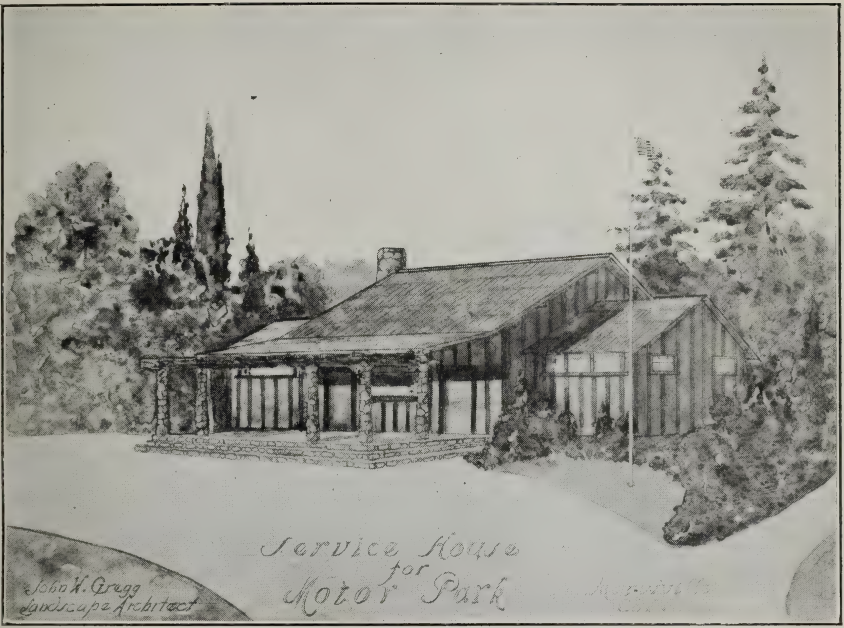
Third, those communities which up to the present have never possessed a well developed park or playground and which can not afford to secure a very large piece of land are meeting this auto camping problem by first having detailed landscape plans prepared which can be followed as fast as time and funds permit. Such plans should provide in a systematic and attractive way for all the features necessary for the health and enjoyment of citizens of the community as well as for those strangers within its gates. If such plans can be prepared in advance of any construction work, all park, playground, and auto camping features can be so arranged as to produce the maximum of service and beauty. The city of Marysville is fortunate in having possessed the foresight to proceed along this line and even a casual study of the plans here presented will convince the most skeptical individual of the value of such a method, for when these plans are carried out, Marysville will possess a park where its citizenship, young and old, can enjoy the cooling shade of beautiful trees, or can gather on the open lawn as an outdoor auditorium and enjoy any kind of entertainment presented from the broad stagelike porch of a beautiful, well equipped and centrally located park house. Well built walks will define two spacious playground areas for small children and a proper mass planting of trees and shrubs will give individuality, privacy and charm to the auto camping section, which is conveniently accessible from two streets. Here the tired but happy traveler will find his individual parking space by the side of an attractive little shelter house equipped with gas, light and water, as well as table and seats. This well kept street of camp-homes centers on the park house where will be provided showers and other comfort station facilities and a chance to rest by an open fireplace after the day's drive. In such a plan the requirements of ''compactness,'' ''utility'' and ''beauty'' have been fulfilled and Marysville will profit greatly thereby.

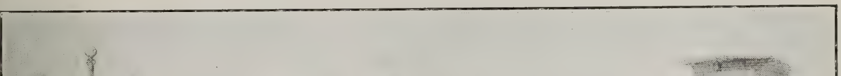
WOOD UTILIZATION SERVICE.

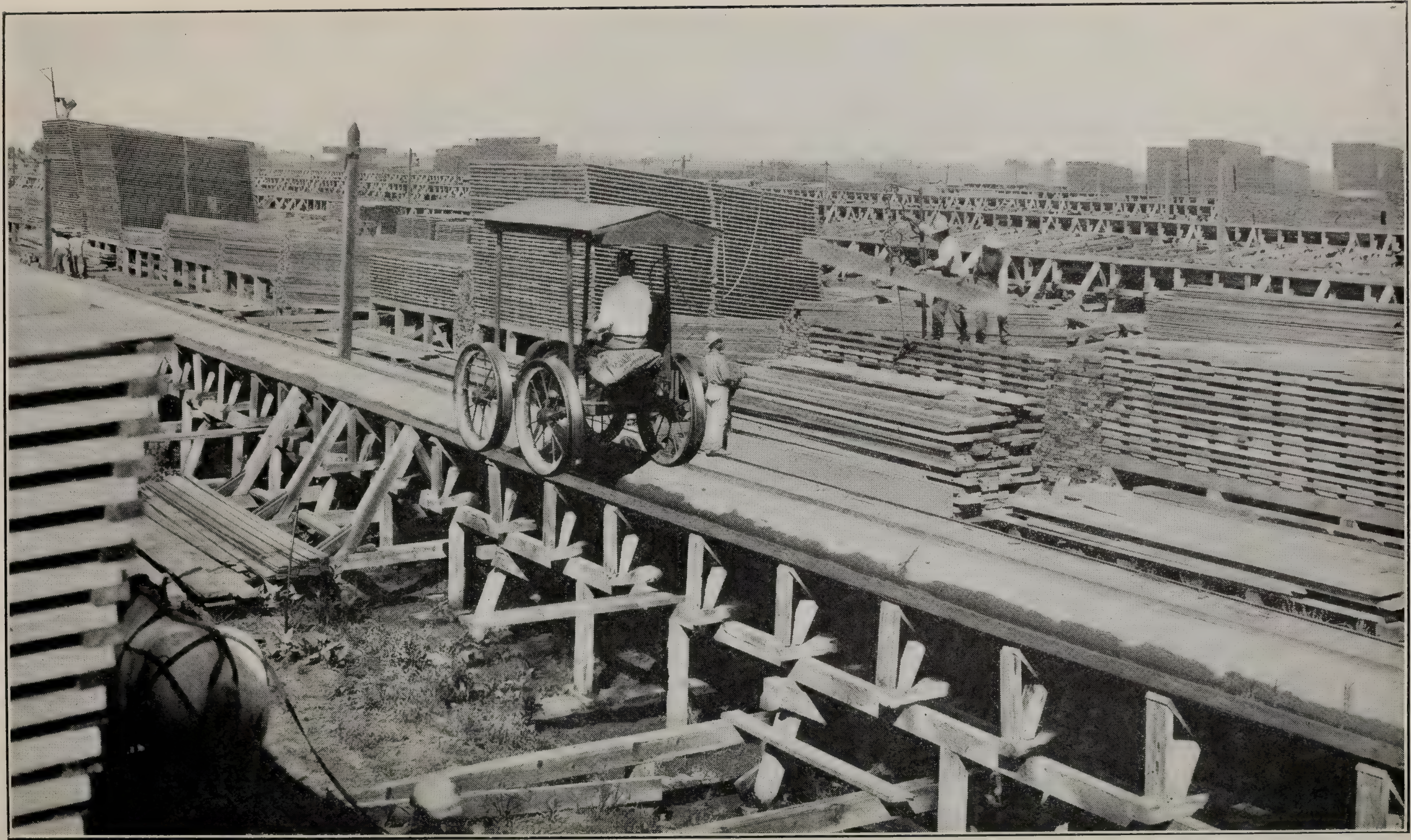
The objects and method of the Wood Utilization Service recently established by the State Forester are stated in Circular No. 6, California State Board of Forestry, to be as follows:

Objects.

The objects of the Wood Utilization Service are to bring the producer and user of wood products closer together, and to furnish information regarding the utilization of wood and its products. The State Forester's office is constantly receiving inquiries about the character, uses and markets for wood products such as lumber, lath, shingles, posts, poles, ties, cordwood, veneer stock, tanbark, sawdust, charcoal, acetic acid and wood alcohol. The war has stimulated the demand for all classes of wood products, and it is evident that much assistance can be rendered to people producing and using these products through a Wood Utilization Service.


Service House for Motor Park
John W. Gregg Landscape Architect
Marysville Cal.





Piling pine lumber cut in the Sierras. California pine lumber manufacturers supplied the government with many millions of feet of lumber, which was used for patterns in shipyards, munition and food containers and other war purposes.

Special attention will be paid to the utilization of wood waste. There are manufacturers who are burning or giving away waste that might profitably be used by some other concern. The waste involved, for example, in making school furniture in an eastern factory was found to be exactly fitted for making scrubbing brush backs in a brush factory many miles distant. A veneer concern burned up the cores until it was found that they made excellent mine rollers. Shoe-lasts are being made from discarded tenpins, and knife-handles from the discarded waste of a maker of shuttle blocks.

There are good opportunities for the better utilization of much of our western timber. Hardwoods, such as oak, cottonwood, laurel, sycamore, manzanita and eucalyptus have been little used except for fuel, but there are indications that they are going to be used much more extensively for the making of wooden articles such as are now being brought in from outside the state. Some of our softwoods, such as Monterey cypress, digger pine and big-cone spruce are little utilized. Notes concerning specific uses of California woods will appear in circulars issued from time to time. Any suggestions regarding their utilization will be gladly received.

It is not the object of the Wood Utilization Service to serve as a brokerage office for the sale or purchase of extensive bodies of timber. All such inquiries which refer to the timber within the National Forests are referred to the U. S. Forest Service. Inquiries concerning timber properties outside the National Forests are referred to logging engineers, whose business it is to appraise timber and give advice on logging and milling methods. This office, however, will be glad to give advice to owners of small tracts of timber as to the value, uses and markets for their wood products. The wider use of wood for fuel to relieve the coal shortage is now being strongly urged by the Fuel Administrator. Any information which will assist in securing a wider use of wood for fuel will be gladly furnished by the State Forester.

Method.

Circulars will be issued as rapidly as the need arises, giving facts about wood products for which a market is sought, and the needs of persons who wish to buy certain kinds of stock. These circulars will be sent to manufacturers, woodworkers, manual training teachers and any one else who may be interested in the utilization of wood. Some of these circulars will take up such matters as the manufacture of charcoal and alcohol, tannins, wood distillation, and other products of wood about which information is constantly being sought.

There is no charge for this service. It is open to any one who wants to buy or sell wood products, or who desires information regarding them.

Persons sending in items for publication in the circulars should be specific as to the amount, weight, dryness, price desired and accessibility.

Address all communications to the State Forester, Sacramento.

The demand for information on wood and its products has plainly shown the need for this service. Following a notice of its establishment in the *American Lumberman*, letters were received from various parts of the country for information on California woods. The number of inquiries within the state is steadily increasing as people find that such a service is available.

The greater part of the inquiries come from rural sections where wood is the favorite building material, because of its suitability, reasonable cost and availability. The farmer finds wood the best all-around material for the majority of farm uses, and therefore, it is important that he should know something of the various woods available, their suitability for farm use, and how to buy intelligently for a definite purpose. Information along this line is contained in Bulletin No. 299, College of Agriculture, University of California, entitled ''The Use of Lumber on California Farms,'' which was prepared by a member of the State Forester's Office, during his association with the university. It may be secured upon application either through the University of California or the State Forester's office.

The war has stimulated a demand for wood and its by-products, such as charcoal, potash and essential oils. Black walnut is wanted by the government for gunstocks and locust for treenails in wooden shipbuilding. Cottonwood, which was formerly used in California only for firewood is now being extensively used for box shooks and excelsior. Potash is being made from wood ashes obtained from sawmills in carload lots. Juniper berries from trees growing in the high Sierras are being used to make an oil much in demand by the government for medicinal purposes. Charcoal is being used by the government for powder and other purposes having to do with the war. The navy yard, Mare Island, California, purchases it under annual contract in accordance with the following specifications:

> ''To be made of oak or willow newly made, clean, evenly burned, well charred, practically all large pieces, and entirely free from small branch charcoal, dirt and other impurities. To contain not less than 78 per cent carbon or more than 21 per cent volatile matter or more than 2 per cent of ash.
>
> ''Alternate bids considered for charcoal made from Douglas fir by the retort method showing a carbon content of 90 per cent.''

The Federal Fuel Administrator of California has fixed the price of charcoal at $20 per ton f.o.b. cars for lump charcoal and $22 per ton in bags, the actual cost of the bags to be added. The demand for charcoal is much greater than the present supply available, and it appears that its production should be generally profitable.

The necessity for an increased use of wood for fuel, the fuel value of different woods and the prices asked, are matters which have been investigated by members of the Wood Fuel Committee serving under the direction of Mr. A. E. Schwabacher, Federal Fuel Administrator. At his request, a member of the State Forester's office who is a member of the Wood Fuel Committee, prepared the following circular entitled "Wood Fuel in California," for distribution throughout the state:

> "The necessity for Californians to save coal is emphasized by the greatly increased needs of our navy, transports, war industries and shipyards.
>
> "Consumption of coal by private residences, apartment houses, churches, schools, commercial buildings and factories producing nonessentials throughout the country must be reduced.
>
> "The availability and quality of wood fuel in most parts of California makes its use instead of coal an easy matter. Coal must continue to be the principal fuel used in those cities located a great distance from the point of wood production. In the majority of cities and towns, and especially in the rural districts of this state, wood fuel from local sources can be used without working any hardship upon the consumer.

HOW WOOD IS SOLD.

> "The cord measure of 8 feet long, 4 feet high and 4 feet in width is the legal measure in California, and applies in the sale of wood in general. The use of the terms 'rick' and 'tier' is confusing and the State Superintendent of Weights and Measures has ruled that these terms shall be abolished. The cord contains 128 cubic feet, well stowed and packed. The legal subdivisions of the cord are $\frac{1}{4}$, $\frac{1}{2}$ and $\frac{3}{4}$, and these subdivisions are equivalent to 32, 64 and 96 cubic feet. Any person who may suspect any short delivery has the right to have the wood measured and corded, and in case of any shortage, the seller is obliged to make good the deficiency or be subject to prosecution under the state law.
>
> "Wood may be purchased in 4-foot lengths and sawed into stove lengths, or secured directly in short lengths from the dealer. The difference in price between a cord of four-foot wood and a cord of short pieces represents more than the cost of sawing inasmuch as additional wood than that contained in the 4-foot cord must be added to make up the required 128 cubic feet. Tests showed that the following number of cubic feet of wood of various lengths were obtained from sawing a standard cord after the wood had been repiled and measured:

12-inch wood	96 cubic feet
16-inch wood	107 cubic feet
24-inch wood	112 cubic feet

> "This means that 32 cubic feet must be added to make a cord of 12-inch wood and the cost of this amount must be considered in calculating the ratio of the price between a four-foot cord and a cord of stove lengths. The number of cubic feet obtained from sawing

a four-foot cord varies according to the size and shape of the sticks. Straight, round or large pieces pile more compactly with less 'air space' than do crooked, split or small sticks. For this reason a cord of four-foot 'body-wood,' which is that cut from tree trunks, will yield more wood when sawed into short lengths than a cord of limbs which are more or less crooked.

"When possible, the season's supply of wood should be secured at one time. Wood bought in small quantities is more expensive than when bought in bulk, and the frequent deliveries consume labor that could be saved by a little foresight on the part of the purchaser. Cases are cited by wood dealers, of families who order a sack of wood every few days which involves unnecessary work for their employees, and an increased price for the consumer. An example of the saving that can be made by buying in bulk is shown by comparative differentials in prices outlined as follows:

Per sack—3 cubic feet—40 cents or 13.3 cents per cubic foot.
Per crate—7 cubic feet—75 cents or 10.7 cents per cubic foot.
One load—21 cubic feet—$2.00 or 9.5 cents per cubic foot.
Two loads—42 cubic feet—$3.50 or 8.3 cents per cubic foot.

"The purchase of wood in sacks should be avoided whenever possible. Farmers have difficulty in getting sacks for their grain, and they should be released as much as possible from the wood business. Delivery is difficult any other way in some instances, such as for apartment houses in cities, but in most places the sale of wood in sacks can be dispensed with to the benefit of everyone concerned.

COMPARATIVE FUEL VALUE OF WOOD AND COAL.

"The fuel value of a stick of wood is in proportion to the weight of the wood when it is thoroughly dry. For nonresinous heavy woods like mountain live oak and eucalyptus, one cord of four foot wood weighing about 4500 pounds, is equal in heating value to one short ton of coal. About 1½ tons of sycamore or valley oak weighing about 3000 pounds, and 2 cords of willow or cottonwood, weighing 2000 pounds, are required to give the same amount of heat as a cord of the dense, heavy wood.

"The available heat value of a cord of wood depends on the amount of moisture present. When the wood is green, part of the heat which it is capable of yielding is taken up in evaporating the water. The greater the amount of water in the wood the more heat is lost.

"The bark and the amount of resin influences the heat value and in resinous woods like Douglas fir and western yellow pine the heat value may approach that of some of the hardwoods. Slabs from these species sell for considerably less than oak, and are very satisfactory for furnaces and heaters, some people using them to the exclusion of coal.

"The following heat values of wood used in California for fuel are the result of tests made by the United States Forest Products Laboratory, and show the relation of heat value to relative prices:

Species	Per cent of short ton coal value, air dry	Price per cord for four-foot wood
Mountain live oak	106	$15 00
Mountain white oak	97	14 00
Eucalyptus	93	14 00
Western yellow pine	58	10 00
Willow	52	8 00
Cottonwood	49	7 00

"Woods with the highest heat values command the highest prices. Mountain live oak can not be excelled as a fuel wood, but the price does not tend to encourage its use, especially among people of moderate means. Considerable valley oak locally called 'mush' oak because of its porous and soft nature, has the lowest fuel value of any of the California oaks, and sells for the lowest price.

"Eucalyptus makes high grade fuel when sufficiently seasoned and is widely used in southern California where there are many plantations which were originally established to produce lumber. It has been demonstrated, however, that the chief value of eucalyptus is for fuel, and now is an excellent time to convert such groves as are not needed for windbreaks, into cordwood for local consumption. Since eucalyptus requires a long period to season it should be cut in the summer in order that it may be ready to burn by winter. The price is lower than for oak as a rule, although it is little below it in heat value. Orange and mesquite are heavy dense woods with high heat value which are used to a considerable extent in southern California.

"Cottonwood and willow are light, porous woods which have low fuel value. They produce a large amount of ash and do not hold the heat. They are little used except in valley regions, and are to be considered only as makeshift fuel. These woods can not compare in heat value to the pine wood of the Sierras or the Douglas fir which is found chiefly along the coast. These species are sold in northern California as four-foot wood, which is cut from the trunks and limbs of trees, as slabs and edgings which is the refuse of sawmills, or as mill blocks which are the refuse from planing mills. In southern California considerable pine wood is shipped in from Arizona. The bark and resin of these woods add to the heat value, and make them satisfactory and economical fuel. In the mountains they are extensively used, supplemented by some oak. Pine slab wood sells for relatively low prices, and its use is rapidly increasing as people realize its value for fuel. At this time when labor is such a serious item, and woodchoppers are so hard to get, this class of fuel should be more widely used. There are thousands of cords of slabs at the sawmills which are burned because of the lack of demand, as well as quantities of limb wood left from logging operations, which has a fuel value equally high.

''In several different sections of California where wood is cheap and abundant, coal and oil are used for fuel. This should not be the case, and citizens should do what they can to release this coal and oil for the use of the government. Every man who has dead, unhealthy or unsightly trees on his place should convert them into wood for his own use and that of his neighbors. The use of wood may cause inconvenience in some cases, but in a state like California where the majority of the people enjoy exceptionally favorable climatic conditions, and where there is such a large supply of wood going to waste, its wider use should be considered a patriotic duty.

CONCLUSIONS.

''1. Every citizen should substitute wood for coal and oil as far as the circumstances will permit, in order to release these classes of fuel for necessary war industries.

''2. Softwoods, such as western yellow pine and Douglas fir, have high heat value and make satisfactory substitutes for the expensive mountain oak wood in many sections of the state. Slab and limb wood is refuse material, large quantities of which are going to waste in the forested regions.

''3. Wood should be ordered in bulk rather than in sacks, since sacks are badly needed for the carrying of foodstuffs to the armies in France, and the labor spent in sacking is nonessential and charged to the consumer.

''4. In view of a possible fuel shortage the wisest plan is to use wood as fuel in those communities adjacent to wooded sections, since there may not be enough coal to supply persons who could have secured wood and neglected to do so.''

EDUCATIONAL WORK.

Fire Prevention Day.

Governor Stephens made April 18 last Fire Prevention Day, and issued the following proclamation:

> "The California State Board of Forestry, having in mind the great losses which the state of California annually suffers through the ravages of fire, desires to impress upon the people of the state the great necessity of care in the use of fire during the coming season. Particularly at this time, when the economic losses brought about by the war are the greatest the world has ever known, should we all do everything in our power to lessen the annual loss which fire causes. Particularly should all the people of California remember how important it is to the prospertiy of our state that vegetation upon our watersheds be protected in order that our subterranean reservoirs may be kept full. To campers, those who are making clearings, and to tourists who travel through the mountain regions especially should the warning apply.
>
> "*Now, therefore,* In order to emphasize the need of fire protection and the importance of the campaign which the State Board of Forestry is carrying on, I do hereby declare the eighteenth day of April, 1918, as FIRE PREVENTION DAY, and trust that on that day all persons will make an effort to place their premises in such condition that the risk of fire be eliminated so far as possible."

In accordance with the purpose of this proclamation, the State Forester issued a "Fire Prevention Day Lesson," 200,000 copies of which were sent to public and private schools throughout California.

Forest fire film.

A film was prepared through the agency of the Forest Industries Committee showing how fire starts through carelessness as well as through incendiarism; how promptly an organized force can respond to a fire, the method of suppression and how the public generally can assist in this important war activity.

Copies of this film, a portion of the expense of which was borne by the State Board of Forestry, are being circulated throughout the state and will eventually be shown in every town in which there is a moving picture house.

Automobile fire signs.

A co-operative arrangement was made between the California State Automobile Association, the United States Forest Service and the State Forester whereby permanent "Help Prevent Fire" signs were posted on mountain and valley roads where the association was doing work this summer.

The signs which are made of metal, are diamond shaped, 24 by 30 inches in size with dark blue letters upon a lemon yellow background. The sign is placed by itself on a 3-inch boiler tube post, set $3\frac{1}{2}$ feet in the ground, or upon the posts holding the road signs. It is expected that the appeal made to the traveling public will result in a decrease in the number of fires set by burning tobacco thrown in the dry grass by the roadside, and by camp fires left unextinguished by careless campers.

First aid manuals.

The present shortage of labor in all lines of productive work has made it necessary to conserve as far as possible the man power left to the various industries. The First Aid Manual which is used by the Forest Service has great value in this connection, and 4000 copies were secured by the State Forester which were placed in the hands of foremen of big ranches, the top men of harvesting crews and with the lumber companies in the state. Prompt first aid such as is described in the manual often avoids an extended layoff of an injured man, and possibly an expensive hospital service. A limited number of these manuals are still on hand at the State Forester's office and will be sent upon application.

Fire literature.

The Handbook of Forest Protection was revised and 15,000 copies were sent out to firewardens and other persons interested in fire protection. Besides the circular prepared for Fire Prevention Day, 150,000 Help Prevent Forest Fire cards, giving rules for care with fire, have been distributed by the State Forester's office, as well as about 20,000 cloth fire signs.

Tree studies.

A study of forest planting in the arid regions of southern California was made by an assistant state forester and appears in this report.

Great interest is being taken in street and highway planting, particularly in connection with the planting of the state highways and the establishment of automobile parks by many of the cities. The advice of the State Forester has often been asked regarding the best species of trees to plant, and the demand for Bulletin 4, Street and Highway Planting, necessitated a reprint of 2000 copies.

Accompanied by an expert photographer a member of the State Forester's office made a trip through central and southern California last spring, securing material for a bulletin illustrative of the shade and ornamental trees that can be grown in the state. About two hundred and fifty views of typical specimens were taken. This bulletin will probably be ready for distribution during the latter part of 1919. The photographs, size 7½ by 9½, are available for educational purposes and can be obtained through the State Forester's office, at a cost of fifty cents per print where less than a dozen are ordered, and thirty-five cents per print if the order is for a dozen or over. Photographs of the following trees and shrubs are available:

Acacia:
- Gum Arabic Tree (Acacia arabica).
- ——— (Acacia elata).
- Blackwood Acacia (Acacia melanoxylon).
- Bailey's Acacia (Acacia baileyana).
- Silver Wattle (Acacia decurrens dealbata).
- Weeping Myall (Acacia pendula).

Albizzia:
- Albizzia julibrissin, Tree and flower.
- Albizzia lopantha.

Araucaria:
- Bidwell's Araucaria (Araucaria bidwellii).
- Norfolk Island Pine (Araucaria excelsa).
- Monkey Puzzle (Araucaria imbricata).
- Moreton Bay Pine (Araucaria cunninghamii).
- ——— (Araucaria braziliana).

Arbor Vitæ:
- Giant Arbor Vitæ (Thuya gigantea).
- Chinese Arbor Vitæ (Thuya orientalis compacta).
- Golden Arbor Vitæ (Thuya gigantea aurea).

Ash, Arizona (Fraxinus velutina).
Australian Brush Cherry (Eugenia myrtifolia).
Bald Cypress (Taxodium distichium).
Banana, Abyssinian (Musa ensete).
Beech, Copper (Fagus sylvatica purpurea).
Beefwood, She Oak (Casaurina stricta).

Birch:
- White Birch (Betula alba).
- Weeping Birch (Betula alba pendula laciniata).
- Red Birch (Betula nigra).

Bottle Brush:
- Bottle Brush (Callistemon lanceolatus).
- Bottle Brush (Melaleuca armillaris).
- Bottle Brush (Melaleuca ericifolia).

Bottle Tree (Sterculia diversifolia).
Box, Brisbane (Tristania conferta).
Buckeye, European (Æsculus hippocastanum) Tree and flower.
California Laurel (Umbellularia californica).
Camphor Tree (Cinnamonum camphora).
Carob Tree, or St. John's Bread (Ceratonia siliqua).
Catalina Ironwood (Lyonothamnus floribundus asplenifolius).
Catalpa (Catalpa speciosa), Tree and blossom.

Cedar:
- Incense Cedar (Libocedrus decurrens).
- Lebanon Cedar (Cedrus lebani).
- Deodar Cedar (Cedrus deodara).
- Mt. Atlas Cedar (Cedrus atlantica).

Cherry:
- Hollyleaf Cherry (Prunus ilicifolia).
- Catalina Cherry (Prunus ilicifolia integrifolia).

Chestnut:
- Italian Chestnut (Castanea sativa).
- Cape Chestnut (Calodendron capense).

Coral Tree (Erythrina crista-galli).
Crape Myrtle (Lagerstrœmia indica) Tree and blossom.
Cypress:
- Guadalupe Cypress (Cupressus guadalupensis glauca).
- Monterey Cypress (Cupressus macrocarpa).
- Italian Cypress (Cupressus sempervirens fastigiata).
- Lawson Cypress (Chamæcyparis lawsoniana).
- Knight's Cypress (Cupressus knightiana).

Cryptomeria, Japanese Cedar (Cryptomeria japonica).
Elm:
- Huntington Elm (Ulmus vegeta).
- Camperdown Elm (Ulmus glabra camperdownii).
- American Elm (Ulmus americana).
- Cork Elm (Ulmus racemosa).
- English Elm (Ulmus campestris).

Empress Tree (Paulownia imperialis).
Eucalyptus:
- Sugar Gum (Eucalyptus corynocalyx).
- Swamp Mahogany (Eucalyptus robusta).
- ——— (Eucalyptus linearis).
- Red Gum (Eucalyptus rostrata).
- Lemon-scented Gum (Eucalyptus citriodora).
- Victorian Ironbark (Eucalyptus leucoxylon rosea).
- Forest Gray Gum (Eucalyptus tereticornis).
- Blue Gum (Eucalyptus globulus).
- Desert Gum (Eucalyptus rudis).
- Manna Gum (Eucalyptus viminalis).
- Bush Blue Gum (Eucalyptus globulus compacta).
- Scarlet Flowering Gum (Eucalyptus ficifolia).

Fir:
- Spanish Fir (Abies pinsapo).
- White Fir (Abies concolor).
- Nordman's Silver Fir (Abies nordmanniana).

Flame Tree (Sterculia acerifolia).
Ginkgo (Ginkgo biloba).
Golden Chain (Laburnum vulgare).
Gum Myrtle (Angophora lanceolata).
Hawthorne:
- English Hawthorne (Crataegus oxyacantha).
- Paul's Double Flowering Hawthorne (Cratægus monogyna paulii).

Hickory:
- Shagbark Hickory (Hicoria ovata).
- Pecan (Hicoria pecan).

Holly, English (Ilex aquifolia).
Hymenosporum flavum.
Jacaranda (Jacaranda ovalifolia).
Japanese Pagoda Tree (Sophora japonica pedula).
Jerusalem Thorn (Parkinsonia aculeata).
Juniper, Irish (Juniperis communis hibernica).
Laurel:
- Laurel (Laurus nobilis).
- English Laurel (Cerasus laurocerasus).

Lagunaria patersonii.
Linden, European (Tilia europea).
Locust:
- Black Locust (Robinia pseudacacia).
- Honey Locust (Gleditschia triacanthos).
- Pink-flowering Locust (Robinia pseudacacia decaisneana).

Magnolia:
  Bull Bay Magnolia (Magnifolia grandiflora) Tree and flower.
  ——— (Magnolia kobus).

Maple:
  Silver Maple (Acer saccharinum).
  Big-leafed Maple (Acer macrophyllum).

Mayten (Maytenus boaria).
Miliusa velutina.

Mulberry:
  Red Mulberry (Morus rubra).
  Teas' Weeping Mulberry (Morus alba tartarica pendula).

New Zealand Pine, Damara Pine (Agathis robusta).

Oak:
  Coast Live-Oak (Quercus agrifolia).
  Valley White Oak (Quercus lobata).
  Cork Oak (Quercus suber).
  Arizona Oak (Quercus reticulata).

Oleander (Nerium oleander).

Olive (Olea europea).
Orchid Tree (Bauhinia purpurea) Tree and blossom.
Persimmon, Japanese (Diospyros kaki).

Pepper Tree:
  Common Pepper Tree (Schinus molle).
  Brazilian Pepper (Schinus terebinthifolius).

Photinia serrulata.
Phytolacca dioica—Argentine tree.

Pine:
  Torrey Pine (Pinus torreyana).
  Canary Island Pine (Pinus canariensis).
  Coulter Pine (Pinus coulteri).
  Aleppo Pine (Pinus halepensis).
  Monterey Pine (Pinus radiata).
  Maritime Pine (Pinus maritima).
  Italian Stone Pine (Pinus pinea).

Pistache (Pistachio mutica).

Pittosporum:
  Victorian Box (Pittosporum undulatum).
  Weeping Pittosporum (Pittosporum phillyraeoides).
  ——— (Pittosporum tobira variegatum).

Plum, Purple-leaved (Prunus pissardii) Single tree and avenue.
Plane Tree, Oriental Plane (Platanus orientalis).
Pomegranate (Punica granatum) Tree and blossom.

Poplar:
  Carolina Poplar (Populus deltoides).
  Lombardy Poplar (Populus nigra var. italica).
  Balm of Gilead (Populus balsamifera).
  Weeping Poplar (Populus tremula pendula).

Privet, Japanese (Ligustrum japonicum).
Pucinia umbo—Brazilian tree.
Red-bud (Cercis occidentalis).

Redwood:
  Bigtree (Sequoia gigantea).
  Coast Redwood (Sequoia sempervirens).

Rose of Sharon (Althea syriacus) Shrub and flower.

Rubber Tree:
  Small-leaf Rubber Tree (Ficus rubiginosa).
  Moreton Bay Fig (Ficus macrophylla).

Silk Oak (Grevillea robusta) Tree and blossom.
Spindle Tree (Euonymus japonica).

Spruce:
    Colorado Blue Spruce (Picea pungens).
    Norway Spruce (Picea excelsea).
    Koster's Blue Spruce (Picea pungens kosteriana).
Sweet Gum (Liquidamber styraciflua).
Tamarix (Tamarix gallica).
Tulip Tree (Liriodendron tulipifera) Tree and blossom.
Umbrella Pine (Sciadopitys verticillata).
Umbrella Tree (Melia azedarach umbraculiformis).
Varnish Tree (Kohlreuteria paniculata).
Walnut:
    California Black Walnut (Juglans californica).
    English Walnut (Juglans regia).
Willow, Weeping (Salix babylonica).
Yew, Irish (Taxus baccata fastigiata).
Zelkova (Zelkova serrata).
Bamboo, MacTear Bamboo (Deodrocalamus latiflorus).
Dragon Tree:
    (Dracaena draco).
    (Dracaena indivisa).
Palm:
    Blue Palm (Erythea armata).
    Canary Island Palm (Phoenix canariensis).
    Cape Palm (Phoenix reclinata).
    ——— (Cocos romanzoffiana).
    ——— (Cocos botryophora).
    Date Palm (Phoenix dactylifera).
    Fan Palm (Washingtonia sonorae).
    ——— (Washingtonia robusta).
    ——— (Washingtonia filifera).
    Guadalupe Palm (Erythea edulis).
    Pindo Palm (Corypha australis).
    Rhapis flabelliformis—a Japanese palm.
    Windmill Palm (Chamaerops excelsa).
    Wine Palm (Jubaea spectabalis).

PUBLICATIONS AVAILABLE FOR DISTRIBUTION.

Biennial Reports State Board of Forestry, 1912-1913, 1914-1915, 1916-1917.

"Yield of Eucalyptus Plantations in California," Bulletin 1, California State Board of Forestry.

"Wood Using Industries of California," Bulletin 3, California State Board of Forestry.

"Street and Highway Planting," Bulletin 4, California State Board of Forestry.

"A Discussion of Log Rules," Bulletin 5, California State Board of Forestry.

"A Mill Scale Study of Western Yellow Pine," Bulletin 6, California State Board of Forestry.

"Wood Utilization Service," Circular 6. California State Board of Forestry.

"Table Showing Board Feet Contained in Lumber of Various Dimensions," California State Board of Forestry.

"Handbook of Forest Protection, 1918." California State Board of Forestry.

"First Aid Manual for Field Parties." U. S. Department of Agriculture, Forest Service.

"The Use of Lumber on California Farms," Bulletin 299, College of Agriculture, University of California.

APPROPRIATIONS AND EXPENDITURES.

The appropriation to carry on the work of the State Board of Forestry for the sixty-ninth and seventieth fiscal years (July 1, 1917, to June 30, 1919) was $47,000, divided as follows:

Salaries:		
State Forester	$6.000 00	
Deputy State Forester	4.800 00	
Assistant State Forester	3,200 00	
		$14,000 00
For support of State Board of Forestry, including field and traveling expenses		27,000 00
For printing, binding and stationery		6,000 00
Total		$47,000 00
Salaries		$14,000 00
State Forester	$4,000 00	
Deputy State Forester	1,800 00	
Assistant State Forester	733 55	
		6,533 55
Unexpended balance October 31, 1918		$7,466 45
Support		$27,000 00
Equipment, supplies and miscellaneous	$1,450 00	
Fire fighting	344 08	
Field and educational work; including meetings attended, lectures delivered and forest and fire investigations	3,693 90	
Postage	735 00	
Telephone, telegraph and express	174 96	
Stenography, typewriting, clerical and general office expense	4,922 12	
Printing paid out of support fund	1,224 35	
		12,544 41
		$14,455 59
Credit to Support Fund for sale of equipment		235 00
Unexpended balance October 31, 1918		$14,690 59
Printing, binding and stationery		$6,000 00
Fire warnings and notices	$648 13	
Fire reports, bulletins, circulars	3,160 59	
Stationery and binding	215 25	
	$4,023 97	
Paid out of Support Fund	1,224 35	
		2,799 62
Unexpended balance October 31, 1918		$3,200 38

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SECOND BIENNIAL REPORT

OF THE

California State Department of Weights and Measures

1917-1918

SACRAMENTO, CALIFORNIA

DECEMBER 18, 1918

CALIFORNIA STATE PRINTING OFFICE
SACRAMENTO
1918

42100

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LETTER OF TRANSMITTAL.

To His Excellency, WILLIAM D. STEPHENS,
Governor of the State of California.

SIR: In accordance with section 13 of chapter 597 of the statutes of California, approved June 16, 1913, I have the honor to herewith transmit to you, and through you to the honorable state legislature, the second biennial report of the State Department of Weights and Measures, from October 31, 1916, to December 1, 1918.

Respectfully submitted.

CHARLES G. JOHNSON,
State Superintendent of Weights and Measures.

SACRAMENTO, CAL., December 1, 1918.

FOREWORD.

The second biennial report of the service of the State and County Departments of Weights and Measures is calculated to prove conclusively that this service is of permanent usefulness and that the benefits obtained through its operation justifies the cost of the service.

I am sincerely grateful to the weights and measures officials of the state for their excellent co-operation and serious application to the recommendations of the state department. Our association has developed a clearer conception of helpful law now well grounded in experience.

The consistent co-operation of the public and their uniform approval and acceptance of the service is to me the real compensation for efforts justly founded and sincerely intended.

CHARLES G. JOHNSON,
State Superintendent.

INTRODUCTORY REVIEW.

The work in which this department is engaged has much to commend itself to the sober judgment of thinking men. It is a work of immense proportions which makes a direct appeal to all broad-minded and right-thinking people. The application of the principles underlying the weights and measures laws reaches more people as a force for good than do any other operative laws of our state. In their many relations with the people they establish a link between helpful law and commercial life.

The consumer, the producer, and the distributor are the three principal factors in our commercial fabric and their systems of exchange are absolutely dependent upon the principle of honest weights and honest measures. Our most serious concern in the enforcement of these laws is to make them truly helpful to these factors. Such help is applied, however, where it is most required. The man at the bottom, the poor people, that great multitude that represents the consumer and especially those of them who can least afford to lose and who can least protect themselves, are our first concern.

There are many evils contending against the honest application of fundamental principles in business. They have a destructive effect on legitimate industry and exchange. These evils must be contended and destroyed in order that the application of honest principles may be made possible and that honest and legitimate competition may continue undisturbed and unrestricted.

One of the great moral objects of this work is to build up a force that will overcome the temptation to be dishonest. Human indifference is one of the most powerful forces that we have to master. It is a most dangerous evil to our constructive commercial policies for it demoralizes and restricts a law of nature which humanity will be forced to accept. Indifference is the most sinister ravager of the horn of plenty. It means waste and opposes every human and governmental energy to conserve and economize.

The enforcement of the weights and measures laws has developed and demonstrated one of the greatest economic governmental forces which effectively protects the true purchasing value of the dollar. Under these laws every scale and every measure becomes a public utility which must weigh accurately for the seller and purchaser alike. The fact that the scale is owned by the seller does not give him any privilege by its operation. Legitimate industry and honest competition essentially depend upon this protection and any person who conspires to violate these principles by disregarding these laws becomes a menace to any community.

Standardization is becoming the general tendency of American industry. The practicability of standardization has been demonstrated as an economic advantage in the manufacture and sale of all commodities, including food products. Its application in the sale of the latter has been found useful to manufacturer and producer and enables the consumer to discern quantity with uniform regularity and makes the application of the weights and measures laws most effective as a protective force against misconduct.

The effect of commercial standardization of food commodities is practically demonstrated by the standard weight of flour fixed and enforced during the last two years by this department. In promulgating this standard, conferences were held at which 80 per cent of the people engaged in the industry expressed their opinions that standardization was essential and practical. A barrel of flour, consisting of 196 pounds was fixed as the maximum unit and the subdivisions were, the half-barrel of 98 pounds, the quarter-barrel of 49 pounds and the eighth barrel of 24½ pounds. All these standards are net weight exclusive of the weight of the container. All mills in the state of California pack their flour in accordance with these standards and any Eastern or foreign mills selling flour in this state must pack a like amount in their containers.

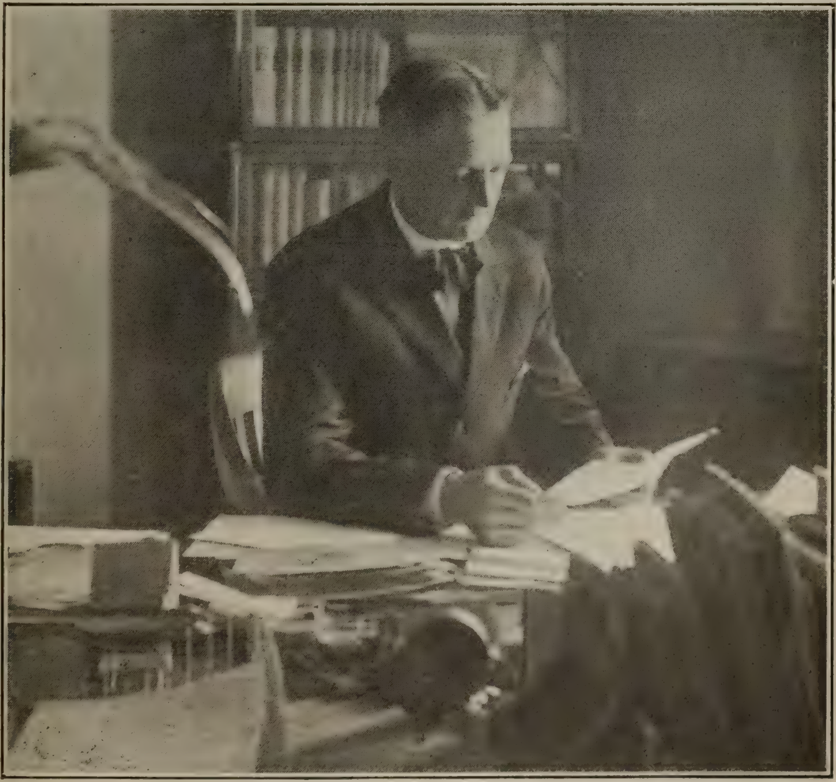
The standards are effectively maintained by constant inspections at the mills. Under these standards the consumer is protected against the delivery of a sack of flour of a less weight than the uniform standard, although the sack in reality may look even larger. Under the standard the state guarantees to the consuming public that whenever they purchase a quarter-barrel of flour, whether such purchase is made by man, woman or child, the delivery consists of 49 pounds. Under the standardization of coal the state defines the meaning of the trade term, "one sack of coal" as being a quantity of coal not less than 100 pounds net weight, and the trade term "sack of potatoes" a quantity not less than 100 pounds net weight.

As a practical and useful public service the department has during the last four years gone through the crucial test and is today well-grounded in the confidence of the people and has the fullest approval and co-operation of the public. Commercial exchanges of every character and proportion are resting upon a firmer basis. The records of weight and measure forming the basis for settlement between the buyer and seller are less cause for dissension and contention than ever before. Commercial controversies over weights and measures records are no longer an irritating menace to our commercial system. The morale has been subscribed to and men have risen to distinguish themselves in their confidence that this department enforces the laws impartially and without fear or favor.

Reweighing at point of destination against point of origin weighings show comparatively no difference except such differences as may occur due to shrinkage, evaporation, or other causes over which the weigher at point of origin had no control, clearly demonstrating the uniform accurate condition in which the scales are maintained.

The weights and measures officials have vigilantly policed the state against possible infractions and violations of the weights and measures laws as well as of the Net Container Act, thereby continuously safeguarding the seller in his legitimate profit while at the same time affording due protection to the buyer and to the ultimate consumer. Through the medium of a progressive spirit of reciprocal justice meted out to one and all alike under the policy of this department since its inception there has developed a fraternal feeling between business men in general expressive of mutual trust and confidence.

Apart from the department being an institution supervising the enforcement of restrictive law, its fundamental principle is to be a "mutual aid" to buyer and seller alike.



Chas. G. Johnson, State Superintendent.

WAR EMERGENCY SERVICE.

Actuated by the spirit of patriotism and determined to make the winning of the war our first concern above all other matters, I placed the services of this department at the disposal of, and pledged the services of all weights and measures officials throughout the state to, Ralph P. Merritt, Federal Food Commissioner for the state of California, the first of December, 1917, calling his attention to the extent of the organization throughout the state and to the fact that each official was clothed with state police authority with an experience which eminently fitted him for the work of effecting compliance with his plans to conserve food products.

Under date of December 5 Mr. Merritt accepted our generous and patriotic offer of co-operation with the United States Food Administration and outlined the policies which the administration proposed to push with relation to conservation of food commodities in general and appointed myself, together with all weights and measures officials identified with the department, as special representatives of the United States Food Administration working in co-operation with and under the general direction of the San Francisco office for the enforcement of the federal law.

The co-operation of this department continued until March 1, 1918, when a policy was adopted under which the service performed by the weights and measures officials was delegated to special federal agencies.

Under date of February 25 the following report of the work performed was transmitted to Mr. Merritt:

> "Referring to your request I herewith transmit a report of the activities of this department acting under your appointment as special representative of the United States Food Administration working in co-operation and under the general direction of your office.
>
> "All instructions and such regulations which have been promulgated by the United States Food Administrator and forwarded to this department, have been transmitted to county sealers of weights and measures and their deputies throughout the state, with special instructions from this department to put same into operation immediately and to familiarize those whom they affect with the intent and purpose thereof.
>
> "With reference to regulations appertaining to the baking industry, this department under the authority of its laws fixed the standard weight of bread in accordance with your recommendations, and caused all ordinances and regulations in conflict therewith to be immediately repealed.
>
> "The baking industry throughout the state was canvassed and all regulations appertaining to the industry was carefully explained. All regulations prohibiting the sale of restricted commodities have also been effectively enforced.

"Attached hereto you will please find a report of violations which have been handled and dealt with out of this office.

"This report does not include all of the cases which have been handled by each county sealer. Their reports are not included herein. I do not hesitate in saying that if all these reports were compiled they would show that over 200,000 pounds of restricted commodities have been caused to be returned into the avenues of distribution from persons who had same in their possession in violation of your regulations.

"While that quantity is comparatively small, the moral effect of the enforcement along educational lines has been very extensive.

"The officials have been instructed to warn all persons who failed to observe wheatless and porkless days, and all violations thereof reported have had my serious concern.

"The same attention has been given to all reports of violations of your regulations appertaining to the advertising of restricted commodities.

"Hundreds of inquiries have been received by letter, and they have been courteously and tactfully answered.

"In all matters appertaining to the enforcement of these regulations, a strong appeal has been made for their observance as a patriotic duty. In many cases other county officers have assisted.

"In the northern and mountain counties of the state where you have not appointed an administrator, I have caused copies of all regulations transmitted to be forwarded to each paper in the county, and all inquiries from these counties appertaining to the regulations have had my immediate attention.

"During the last thirty days I have personally made seven public addresses on the subject of food conservation, and I find that the public today realize more than ever before the seriousness of the food situation, and are conscientiously endeavoring to adjust themselves to the new order of things.

"The work has been interesting and pleasant, and while it has crowded the department and lengthened our hours, we want to assure you that I am grateful for the opportunity of being able to assist you, and any matters of any character which you may refer will have our immediate and earnest attention, and no matter of whatever character will be neglected.

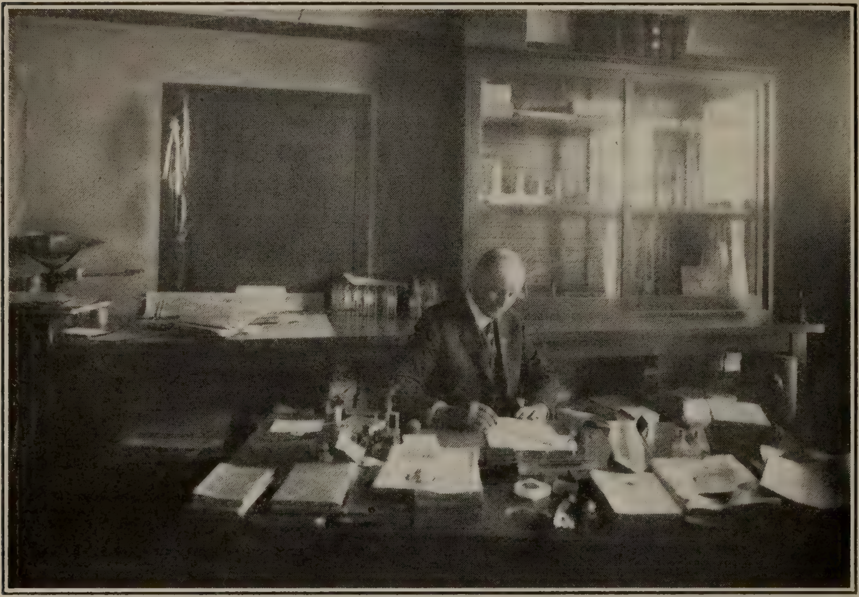
"Extending to you my very best wishes for the continuation of your very important work, I have the honor to remain,

Sincerely yours,

Chas. G. Johnson,
State Supt. Weights and Measures."

During the period of our co-operation with the Food Administrator all work appertaining to weights and measures was generally suspended throughout the state and consequently the report for 1918 will not show the extensive work performed during 1917.

The weights and measures officials are to be highly commended for their untiring and efficient work in policing the state in the interest of food conservation. Mr. Merritt was truly appreciative of our co-operation and the department will always feel grateful for having been afforded the opportunity of in a practical way aiding our country in the successful prosecution of the war.



Chas. F. Hayden, Chief Deputy.

APPOINTMENTS.

Acting under authority as provided for in section 3 of the Weights and Measures Act, I appointed on March 1, 1917, Charles F. Hayden as chief deputy, succeeding William C. Hendricks, resigned.

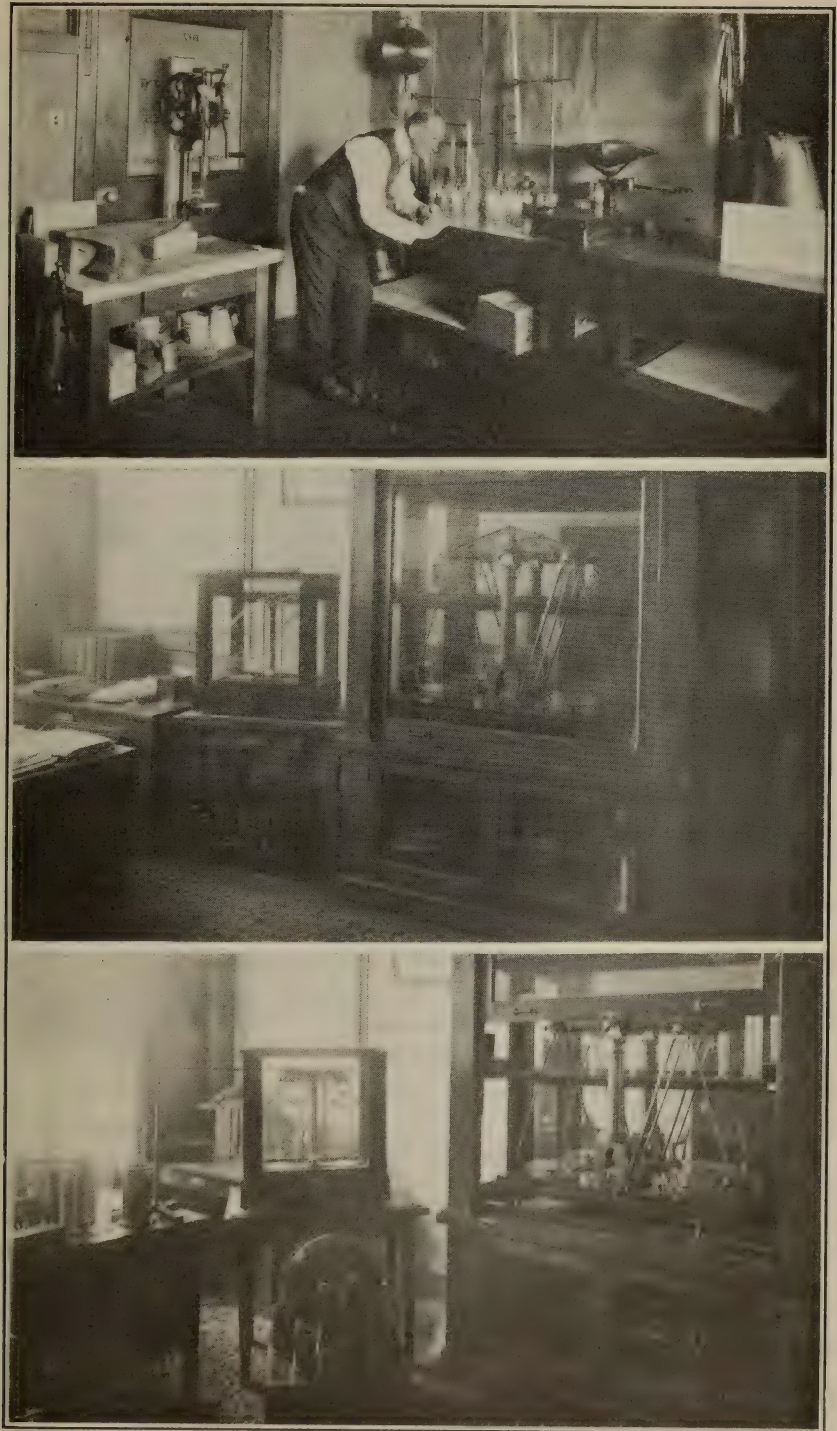
On October 1, 1917, I accepted from the State Civil Service Commission the certification of Miss Rose M. Fisher as chief clerk, position made vacant by resignation of Mrs. Rhoda L. Chapman.

On November 19, 1917, I accepted from the State Civil Service Commission the certification of Miss Blanche Batcheller as stenographer, position made vacant by resignation of Miss Lizetta E. Krause.

SPECIFICATIONS AND TOLERANCES

The specifications and tolerances promulgated and approved by the National Bureau of Standards and adopted by this department have been found practical and applicable in the inspection of the weights and measures throughout the state, requiring no changes therein.

The inspection service during 1917 was extended to include the inspection of prescription scales and balances and apothecaries' weights, which necessitated the adoption of tolerances and specifications covering these types of apparatus. Additional specifications and tolerances, like those governing the employment of heavier apparatus, were prepared and submitted to the National Bureau of Standards for approval, printed in pamphlet form and supplies forwarded to the weights and measures officials for general distribution.



Office and Laboratory Equipment.

PRECISION AND OTHER TESTS.

Under the provisions of the act it becomes the duty of the superintendent to test and certify to the accuracy of all copies of standards employed by the sealers at least once in two years. The calibration of these standards demands the highest degree of accuracy and is a slow and tedious work. All errors noted by comparison with the state standards on the most scientific weighing apparatus obtainable are corrected and state certificates of accuracy covering each test noting therein each correction is issued.

The demand by the public in general on the department for calibration of scientific weighing and measuring devices of every type and character, as well as commercial weights and measures, is constantly growing and places a heavy tax on the department. During the last two years certificates of accuracy covering the testing and sealing of the following weights and measures were issued:

3,024	avoirdupois standard test weights.
1,282	apothecary standard test weights.
1,186	troy standard test weights.
740	metric standard test weights.
682	standard liquid capacity measures.
218	cylindrical graduates.
164	linear measures.
480	miscellaneous standards for commercial use.

This makes a total of 7776 weights and measures and weighing and measuring devices, the majority of which required more or less adjustment and many extensive corrections.

STATE DEPUTY SERVICE IN COUNTIES OF THE THIRTY-FIFTH TO THE FIFTY-EIGHTH CLASS.

Section 17 of chapter 786, amended statutes of 1917, suspended the power of the county boards of supervisors to appoint the county sealer and delegated the work of the county sealer to a deputy state superintendent and gave the power of his selection to the state superintendent.

These amendments placed the responsibility for the efficient conduct of the service in these counties directly upon the state department and presented many perplexing problems to effect the proper organization under which to perform the work efficiently and expeditiously, thereby meeting the constant demand for economy by the county.

In developing the new conditions I retained in the service several of the county sealers who, by reason of their experience, had become efficient, and delegated to them jurisdiction over several counties thereby reducing the cost of the service of the sealer in counties affected by the amendments, and at the same time providing continual employment for the deputy.

To the legally appointed sealer of Colusa County I delegated jurisdiction as deputy state superintendent to perform the duties of sealer in Tehama, Glenn, and Lake counties; and to the sealer of Merced County I delegated jurisdiction over Madera and Mariposa counties. The extension of the service, however, required the selection and appointment of three additional deputies. The present plan of jurisdiction is scheduled as follows:

J. C. Kesler: Modoc, Lassen, Nevada, Plumas and Sierra counties.
A. M. Wallen: El Dorado, Calaveras, Amador, Mono, Trinity, Alpine and Tuolumne counties.
Roy P. Thorpe (Sealer for Merced County): Mariposa and Madera counties.
P. H. Northey (Sealer for Colusa County): Tehama, Glenn and Lake counties.
John H. Martin: Inyo, Imperial, Yuba and Sutter counties.
Benj. B. Shaw: San Benito County.

In the appointment of county sealers by the legislative bodies men were selected from the citizenry who were directly affiliated with the political complexion of the majority of the legislative body and were constantly being changed as the complexion of the legislative body was changed. These conditions entailed endless time and patience to train and educate the person selected and no sooner had he developed competency by reason of experience when he would be summarily dismissed and another person appointed.

Due to the peculiar requirements of persons engaged in the service I have at all times strenuously endeavored to divorce the department entirely from political influences. The county appointment as a rule were men of sterling character and men willing to seriously apply themselves. Many, however, were of the opinion that the service would provide annual employment. Such, however, was not the case, for the work in counties of the thirty-fifth to the fifty-eighth class should be thoroughly performed within a period not to exceed four months.

Under the scheme of grouping several counties to a deputy superintendent it provides for him annual employment and the efficiency of the service is not impaired by long periods of nonemployment. In every instance I have assigned only men well trained in their duties and thoroughly familiar with all weights and measures laws and policies of this department. They were constantly admonished to render this service expeditiously at the lowest possible expense to the county, and it is with satisfaction that I can conscientiously testify that the deputies have performed their duties in this respect with full satisfaction to the people, and the approval of the county legislative bodies.

In directing the attention of the county legislative bodies to the changes effected by the amendments I emphasized the fact that the duties incumbent on a sealer were of a character that called for a serious application to scientific problems, a knowledge of mechanics and unusual physical fitness, executive ability, attended with tact and above all, good common sense. These qualifications were essential in the person of the sealer in order that the service be valuable and useful. In most instances men of excellent type and character were selected. They were, however, unfamiliar with nearly every phase of their work, as well as the law, and upon the superintendent devolved the duty of schooling and preparing them in the practical, scientific, mechanical, legal, and technical duties. The importance of their work was seriously impressed on them, inspiring them to obtain the highest possible standard of efficiency. In most instances the sealer was directed to come to Sacramento, where he was given my personal attention. A convenient room was obtained where every weighing and measuring device in use throughout the state was provided for practical demonstration. The various provisions of the law were carefully construed. After a period of practical training and careful study they were subjected to a departmental examination consisting of twenty questions on each of the following subjects, namely, "Scales," "Measures," and "Law." Their standard of efficiency can in a measure be judged by the fact that the lowest marking was 88 per cent out of a possible 100 per cent. Lectures on various subjects were prepared for their benefit and the policy inaugurated by the department relative to the enforcement of the laws was carefully explained to them, which policy provided for the enforcement of the laws along educational lines, calling for the highest exercise of good common sense, tactfulness and dignity.

A computation of the expense of operation of the service under state jurisdiction as against the cost under county appointment shows a saving in nearly every instance of approximately 50 per cent, and in many counties even more.

COUNTY SEALERS AND DEPUTY COUNTY SEALERS HAVING JURISDICTION IN COUNTIES OF THE FIRST TO THE THIRTY-FIFTH CLASS.

Los Angeles — Charles M. Fuller.

Deputies:

F. J. Berba.
C. J. Buck (absent on naval duty).
F. W. Bundy.
J. D. Fisher.
R. D. Haskell.
R. D. Modie.
B. R. Yates (stenographer).

San Francisco — Lawrence J. Dolan.

Deputies:

M. J. Welch (chief deputy).
Thos. Slavin.
Chas. Wentworth.
James Hughes.
Henry McMahon.
Samuel Wacholder.
Mrs. S. Wright (stenographer).

Alameda — Edward K. Strobridge.

Deputies:

M. P. Scott.
John Carey.
J. J. Donovan.
Dave Boyle.
Miss Belle Carey (stenographer).

Santa Clara — A. G. Walker.
Fresno — H. P. Jayne.

Deputies:

F. B. Johnson.
L. H. Beebe.
Mrs. H. P. Jayne.

Sacramento — James Duffee.

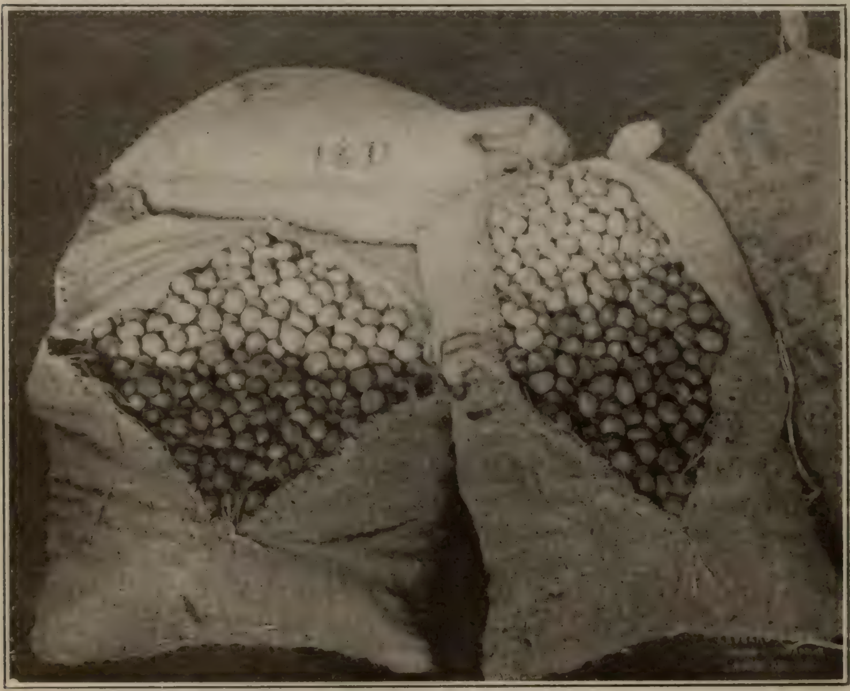
Deputy:

R. N. Philpot.

San Diego	Virgil Bruschi, Jr.
San Bernardino	S. F. Kelley.
San Joaquin	O. T. Melton.
Sonoma	John L. Gist.
Kern	L. H. B. Farr.
Tulare	A. M. Coburn.
Riverside	George L. Wing.
Orange	George McPhee.
Humboldt	Mrs. Robt. D. Johnston.
Contra Costa	F. Judson Biglow.
Santa Barbara	J. N. Watson.
Solano	H. Polland
Butte	A. J. Storey.
San Mateo	Matthew M. Grady.
Santa Cruz	Humphrey Pilkington.
Marin	M. C. Doody.
Monterey	Carl F. Menke.
Mendocino	W. B. Coombs.
Stanislaus	C. E. Tucker.
Napa	J. S. Kesler.
San Luis Obispo	R. L. Dempsey.
Shasta	S. S. Stickley.
Siskiyou	R. O. Gwyn.
Ventura	Geo. S. Wilson.
Placer	C. F. Richter.
Kings	J. C. Griswold.
Merced	Roy P. Thorpe.
Nevada	J. S. Kesler.
Yolo	Geo. A. Farish.

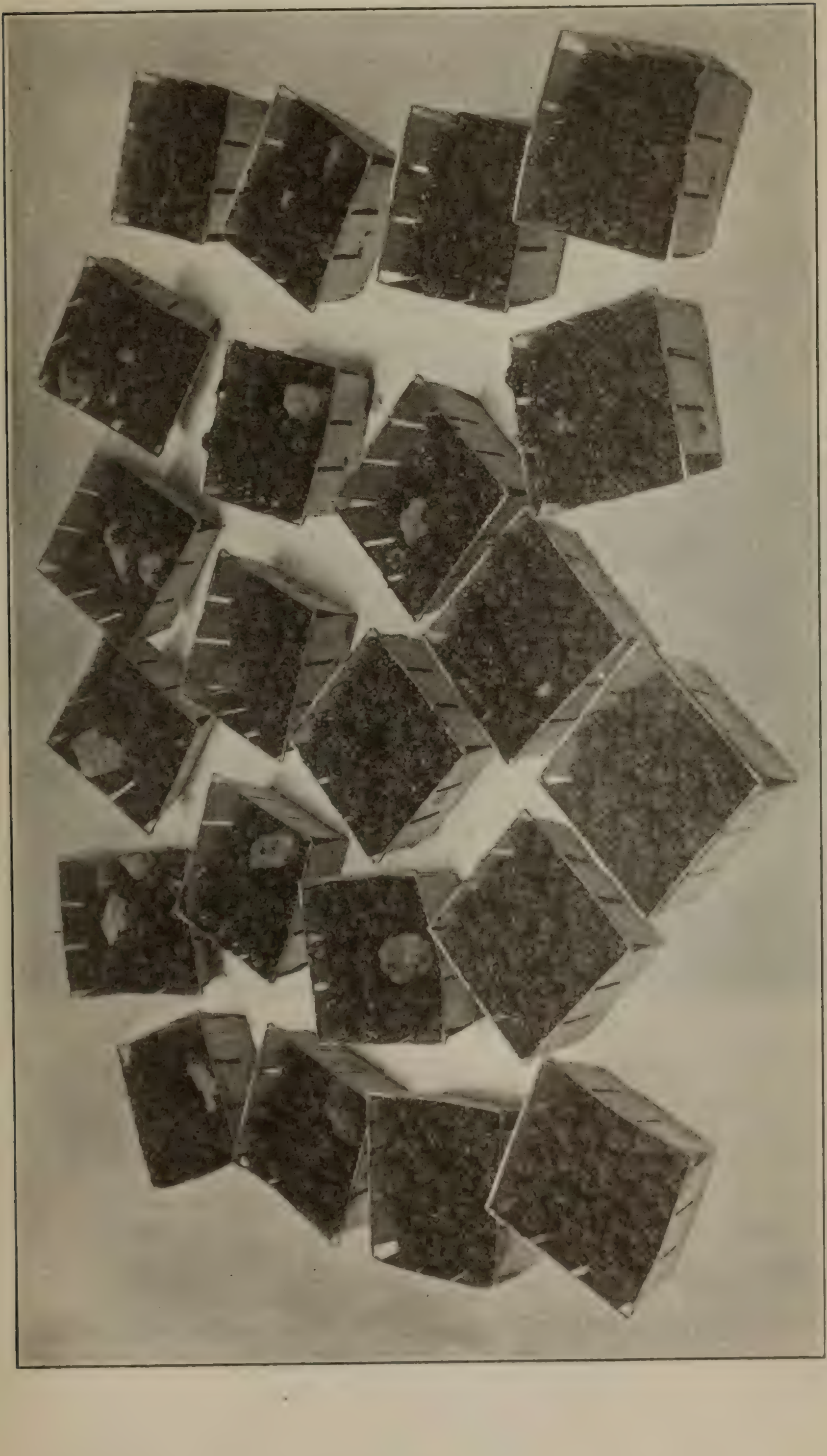
INVESTIGATIONS AND PROSECUTIONS.

In dealing with the thousands of complaints that have officially been referred I have consistently adhered to the educational policy and only in extreme cases have prosecutions been recommended. Every complaint has been carefully investigated and every communication has had prompt and courteous attention. In making investigations relative to complaints, as well as trade customs and matters, I have had the fullest co-operation of the sealers throughout the state and no case referred to the department has failed of full and proper investigation of facts. These investigations form the basis for departmental opinions which have invariably solved the controversy and prevented court procedures. Complaints, the investigation of which disclosed premeditated intent to defraud, and providing that such fraud constituted a violation of the weights and measures laws, prosecutions were instituted.



A Study in Camouflage. "Loaded" sacks of walnuts with culls cleverly covered with No. 1 budded nuts.

This policy has proven a strong link in extending and developing the service into diversified avenues of exchange where it has proven itself truly beneficial and useful. The effect of the recommendations in controversies are usually accepted by the contending parties. Sixty-two thousand bushels of wheat were refunded to farmers in Monterey



Rocks concealed in berry baskets to make them weigh up to the standard.

county, $3,000 refunded on excessive tare of lug boxes to farmers in and about Stockton; and to asparagus growers, as the result of the same fraud, approximately 500,000 pounds of asparagus were refunded on the recommendation of this department.

Space here does not permit me to report the details of the some 600 complaints which have ben adjusted.

INSPECTION OF GASOLINE.

Since the inception of this department there have been constant complaints over the substitution of "distillate" for "straight refined gasoline." During the last three months these complaints have been much more numerous, and investigations establish the fact that the practice of substitution is becoming very common. Under date of October 4 I directed the special attention of the weights and measures officials to these matters, and instructed them to make a careful investigation of all service stations in their jurisdictions, ascertaining if gasoline and distillate were handled and the manner in which the two commodities were stored, and if any circumstances facilitated the perpetration of fraud complained of, to obtain a sample of the commodity sold for gasoline and forward to this department for analysis; to carefully investi-

Mr. E. D. Griffith, Chemist in charge of State Laboratory, testing gasoline samples.

gate all stations to which suspicion was directed, and obtain necessary evidence.

In compliance with these instructions several hundred samples were drawn throughout the state and forwarded to this department, where each sample was carefully analyzed and tested by Mr. E. D. Griffith, the state chemist; certificates of test were then issued and returned with recommendations. An extensive publicity campaign was inaugurated, which together with the inspection service proved an effective temporary relief.

Distillate and straight-run gasoline are identical in color and odor, and distillate may under test show the same specific gravity as gasoline. The two products, however, differ essentially in quality, which difference expresses itself most forcibly in the selling price. Distillate retails at 12 cents per gallon and gasoline at 21 cents per gallon.

It appears that the most practical manner of preventing the compounding or adulteration of gasoline with distillate is to cause distillate to be of a color differing from that of gasoline. The matter was referred to Mr. Griffith, and after many experiments it was found feasible and practical. A color was developed that would remain suspended permanently and at a cost of one mill per gallon.

On completion of the experiments I addressed one of the largest oil companies under date of December 2, in part as follows:

> "On the subject of distillate coloring you state that it has not been found practical, and that at present it would be impractical, on account of not being able to get the material for the coloring of distillate.
>
> "Replying hereto, I beg to advise that I have continued extensive experiments in coloring of distillate and can recommend a coloring substance which will remain suspended permanently and of sufficient volume to clearly show its color when added to seven-eighth parts gasoline. In other words, one-eighth part colored distillate would show its color in seven parts gasoline, thereby effectively indicating adulteration. This coloring in the original volume will add an expense to the distillate of less than one-half mill per gallon. One grain will color five gallons of distillate.
>
> "This department is largely concerned in the sale of distillate at public service stations, where most of the adulterations have been traced. The continual analysis of samples conclusively demonstrates the enormity of the deception practiced on the public by the sale of compounded gasoline for the straight run. These conditions emphasize the practicability of coloring distillate.
>
> "Would it not be well to develop a condition that will for all times remove the apparent identity of gasoline with distillate?
>
> "The owners and operators of automobiles are undoubtedly the largest consumers of gasoline. They represent a mass who can least protect themselves against adulteration, due to the fact that only a small percentage of them really understand the difference between

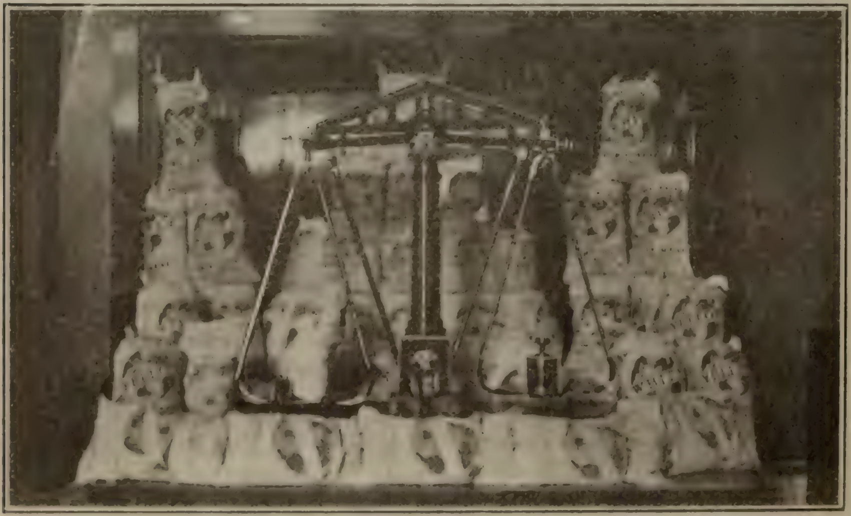
> gasoline and distillate, and are only conscious of the deception after damage has been done to their automobiles, not saying anything about the monetary loss as the result of selling a compounded gasoline at the price of the straight run product.
>
> "I shall be pleased to place the results of all experiments of coloring distillate before you and give you the benefit thereof."

As evidence of the result of our efforts to stop substitution of gasoline I quote from report of Clarence E. Tucker, sealer for Stanislaus County, who writes:

> "Two convictions in Stanislaus County were, in my opinion, one of the most common frauds, yet one of the most dastardly of all frauds, and that is the selling of distillate for gasoline, or more common, the mixing of distillate with gasoline. I know of no case, either civil, or criminal, which at the time caused any more congratulatory criticisms than the arrest and conviction of W. F. Parker and R. R. Hogeboom, Modesto, for mixing distillate with gasoline. Records of the gasoline sales in Stanislaus County for year 1917 were three million four hundred eighty-one thousand six hundred eighty-seven (3,481,687) gallons, representing at 20 cents a gallon, $696,337.40. Just think what a thieving proposition it is to mix with this, distillate, or a commodity inferior both in grade and price. I am pleased to say that the business of these two men was such, upon conviction, that they were compelled to tear down their plants and move away; I suppose to prey upon some other community."

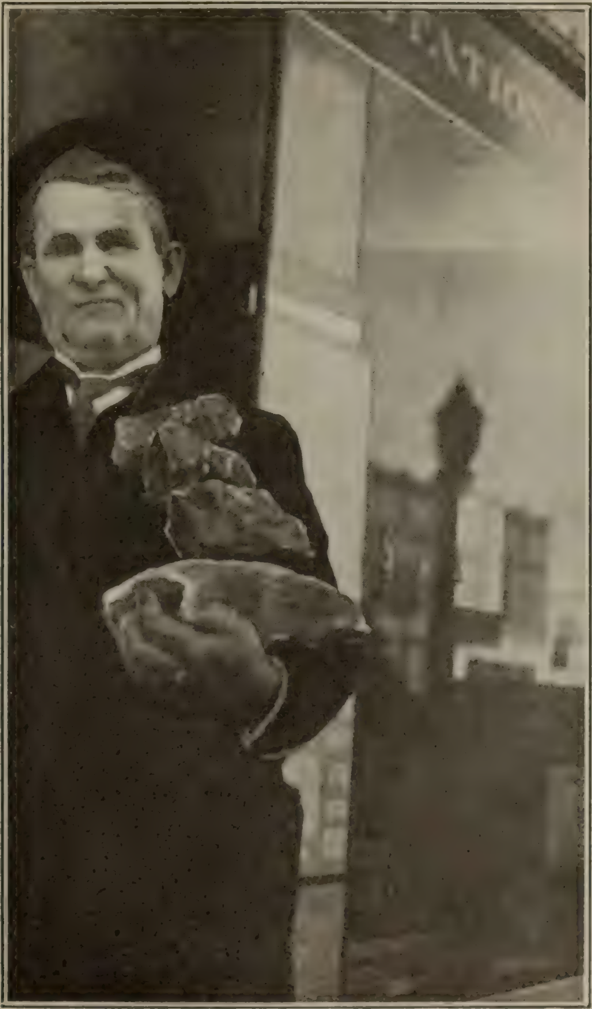
THE NET CONTAINER ACT.

The Net Container Act, as amended in 1917, and designed to protect purchasers of any commodity within its provisions against deception as to quantity or amount of the commodity purchased, when such con-



Short weight containers inspected and confiscated by Los Angeles County Department.

modity is sold, offered or exposed for sale in a container, has proven a comprehensive and workable law. The purposes intended under the provisions of this law have been tactfully accomplished, with the result that today no legitimate packer or manufacturer of food products would presume to offer or expose them for sale without declaring the contents thereof on the label.



Sixty-nine pounds of rock found concealed in one bale of hay, by George McPhee, Sealer for Orange County.

The problem confronting the department has been to inspect these containers and verify the actual weight or measure of the commodity packed with the declared contents. During 1915 and 1916, 346,279 containers were inspected; during 1917 and 1918, 874,000 containers were inspected. The variance noted in the tabulations under the heading of "Containers Inspected" demonstrates the necessity for the inspections.

Many vicious violations of the law have been prosecuted, and many customs conflicting with its purposes have been corrected. The importance of this law is best demonstrated by a late investigation of a sale of string beans in containers, which declared contents 6 pounds net weight, and which upon inspection was found to contain 2 pounds 10½ ounces of string beans and 3 pounds 10½ ounces of water. Before proceeding with the prosecution of this case it was referred to the Department of Agriculture for opinion relative to the interpretation of the Federal Net Container Act as affecting the case. Quoting from their opinion, they write in part as follows:

> "The quantity of contents of cans of string beans should be the net contents of the amount of the food material in the cans. In other words, the weight of the drained beans."

As additional evidence of the importance of the rigid enforcement of this law as a protection for legitimate industry, I beg to refer to a complaint against the pernicious practices of several firms engaged in the packing of olives in containers. The declared contents of 4 pounds of olives conveyed to the purchaser that he was obtaining this quantity of olives. Upon the inspection of the container it was found that the contents of olives weighed 2 pounds 1 ounce, and the weight of the brine 1 pound 15 ounces. Unless this law was rigidly enforced nothing would prevent a packer of olives to declare contents at 5 pounds and pack one pound of olives and four pounds of brine. As the result of the enforcement all olive packers are today packing their olives and declaring the net weight of the fruit exclusive of the weight of the brine.

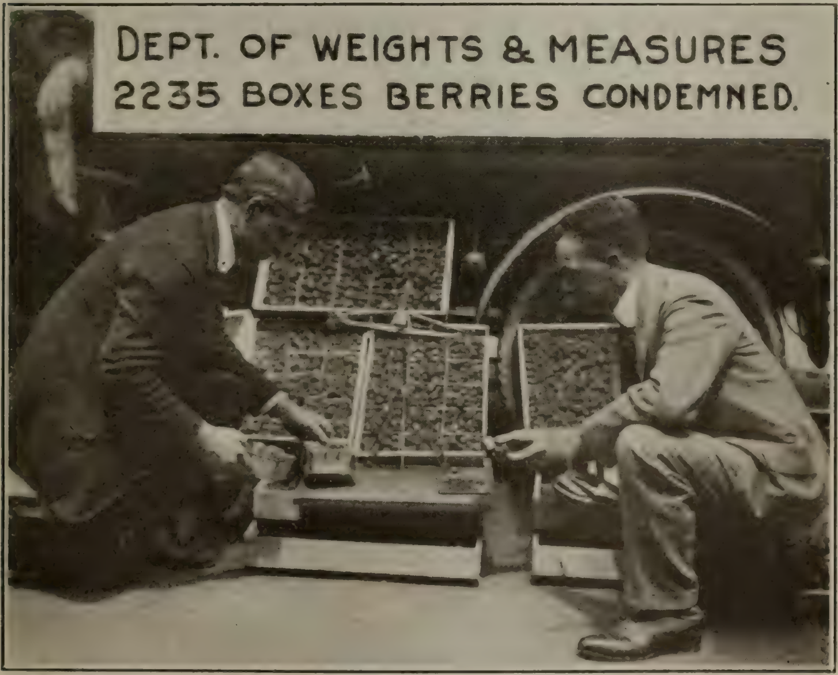
The application of the principle of this law is a fundamental necessity in the interest of legitimate industry, and provides a substantial and effective relief against deception and fraud to the ultimate protection of the consumer. The influence of the department has been extended under this law to effect the standardization of containers in accordance with the regular standards and subdivisions of the established systems of weights and measures. Imported olive oil was packed in containers, which from all appearance were one gallon cans. On close observation the declared contents were noted in small figures 3 quarts 1 pint 10 ounces, sufficient variance from the standard gallon to permit of underselling the merchant marketing the full gallon. Unless this commodity was standardized in accordance with the regular subdivisions competition would develop on the basis of quantity instead of money value.

The beer bottle originally held 32 ounces. Erroneous competition reduced the size until today a commercial quart of beer contains approximately 22 ounces. The enforcement of the Net Container Act has eliminated entirely the false bottom bottle and the solid glass bottom bottle, intended entirely to deceive quantity. These are now of no avail. The amount declared on the label is the quantity which must be delivered.

It is with gratification, and I am duly thankful, for the excellent and substantial co-operation extended the department by the manufacturers and packers throughout the state, and their compliance in general with the requirements of this law.

BERRY BOXES

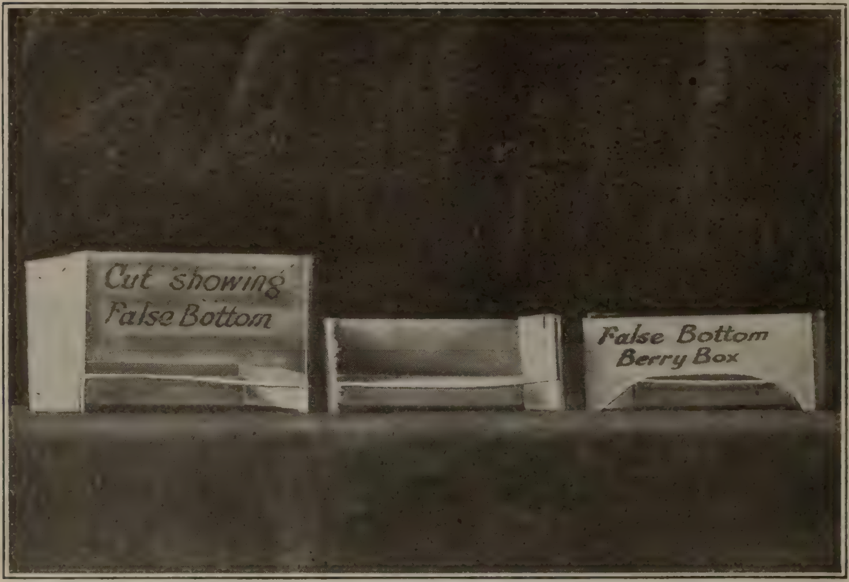
The adoption by the berry growers throughout the state of the standard for berries when sold in containers, promulgated and fixed by this department under date of May 5, 1916, has been uniform. Under the provisions of the Net Container Act the individual berry box is a container. This fact is established, not alone by this act, but by the opinion from the Federal Department of Agriculture, and were this department to rigidly enforce the letter of these laws it would cause the growers of berries to indicate the contents on each individual berry box.



Sixty-four thousand crates of berries were inspected as to weight.

Under the standardization regulations this department establishes the crate or drawer as a container, and requests that the crate or drawer be declared as to quantity. This certainly is a broad interpretation of the law.

Under the regulations the commodity is standardized, and not the container. The employment of a standard sized container would not safeguard the public against a variation in the quantity packed. The purpose of the regulations is to safeguard the public against fraud and deception in quantity when this commodity is sold by peddlers, vendors and merchants, and tends to protect competition among the growers.

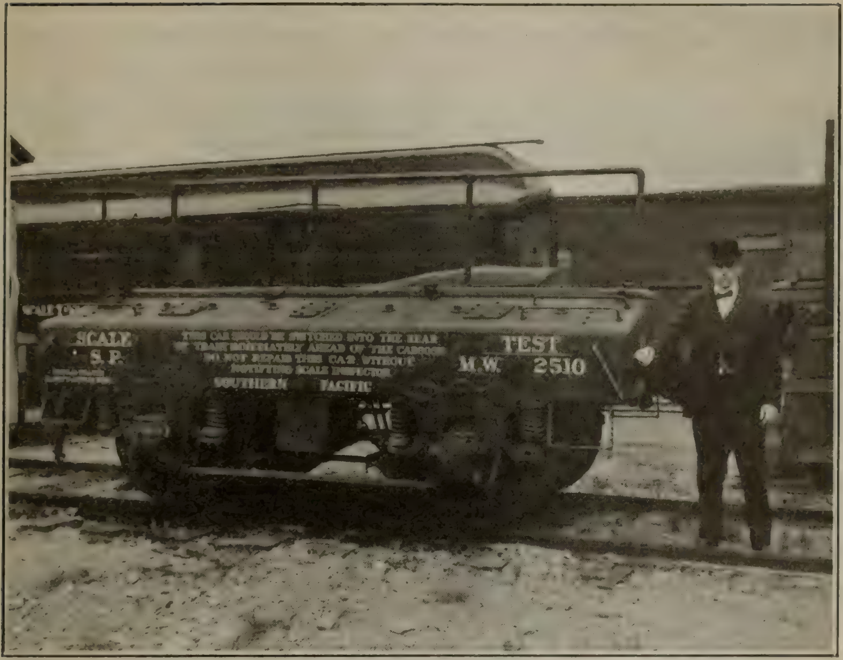


False bottom berry boxes.

Boxes, baskets or other containers with raised or false bottoms have not been permitted in the distribution and sale of berries. This department firmly contends that the sale of berries in false bottom baskets facilitates the perpetration of fraud and defeats the purpose of the weights and measures laws. All contentions to the contrary are in my opinion subterfuge arguments for the employment of a container which is deceptive in construction and whose employment defeats the principle of legitimate competition.

RAILROAD TRACK SCALES.

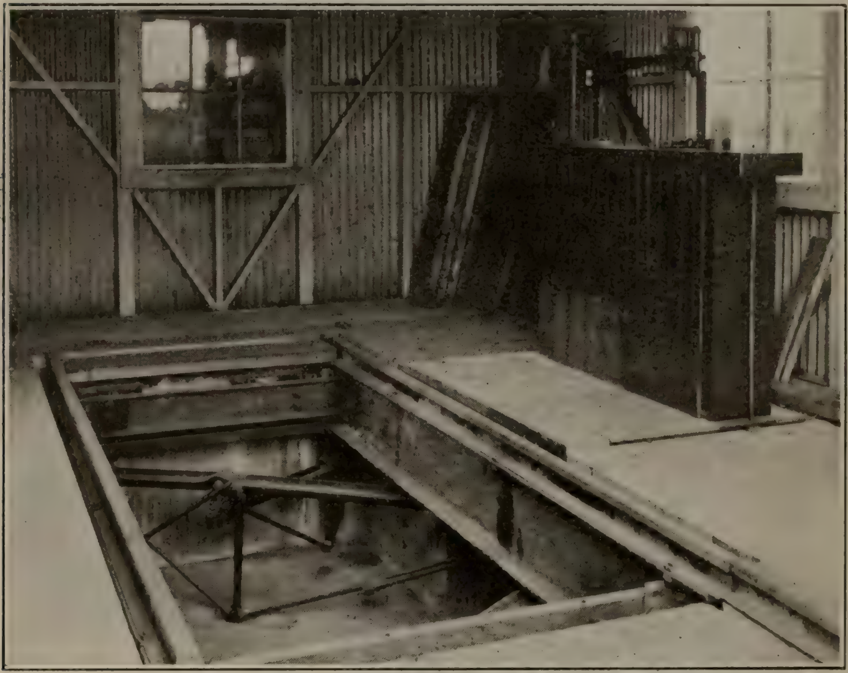
No service of this department is of more importance than the inspection and testing of railroad weighing apparatus. All railroad tariffs or charges for hauling are based on the weight or measurement of the commodity hauled and consequently every commodity hauled must be weighed or measured and such records forming the basis of settlement must be true and accurate. The importance of all demands in this


SCALE
S.P.
THIS CAR SHOULD BE SWITCHED INTO THE REAR OF TRAIN IMMEDIATELY AHEAD OF THE CABOOSE
DO NOT REPAIR THIS CAR WITHOUT NOTIFYING SCALE INSPECTOR
SOUTHERN PACIFIC
TEST
M.W. 2510

Track scale test car maintained by Southern Pacific Company, in charge of George A. Easton, Chief Inspector.

Testing a modern hundred and fifty ton capacity railroad track scale with U. S. Bureau of Standards equipment; each test weight weighs ten thousand pounds.

respect is best illustrated by the extensive work performed by the carriers who maintain a special scale repair organization under the direction of George A. Easton, a most efficient and capable scale expert. Through the co-operation of this organization, together with that of the Federal Bureau of Standards, a most satisfactory system of inspection of railroad track scales has been put into effect.

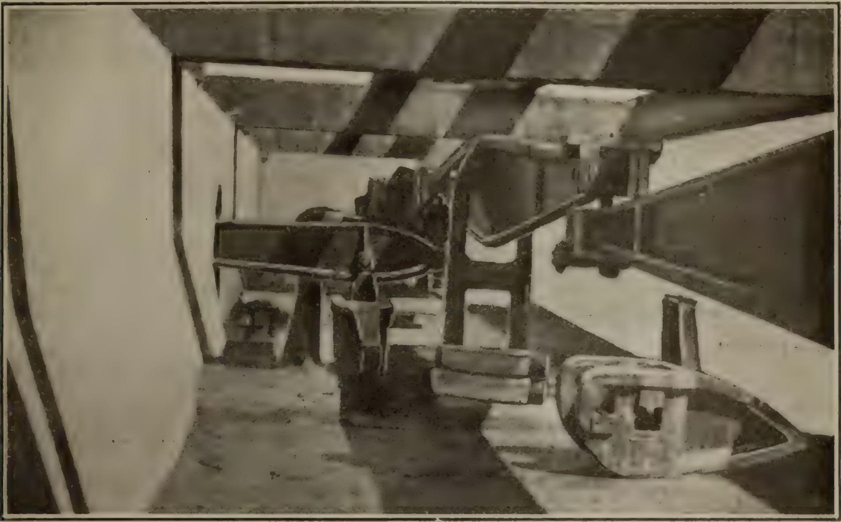


Master scale used only for weighing test car.

The equipment for testing the accuracy of these gigantic weighing machines consists of several cars constructed for the purpose. These cars, together with other standard weights employed, are tested on master scales and sealed by the department. The master scales, together with as many more as time will permit, are tested annually by the equipment furnished for this purpose by the Federal Bureau of Standards. This equipment consists of an oversize railroad car equipped with electric cranes and 90,000 pounds of standard legal test weights. Each lever and each part of the platform is carefully checked and all nominal errors noted are corrected. When the inspection is completed the apparatus must be correct within the allowed tolerance of one pound in one thousand.

All scales which are found inaccurate and which require new parts or extensive repair are condemned for a period of time in order that these repairs may be made, when they are again tested for accuracy.

With the employment of this apparatus it is just as easy to place a 10,000-standard weight on the corner of the platform as it is to place a 1-pound weight on a counter scale.



Pit of a modern one hundred fifty ton railroad track scale.

Since the inception of the department the carriers have come to a full realization of the importance of accuracy of every railroad track scale and as a result they themselves have developed a special organization with experienced crews who inspect and repair and install the apparatus, and when same is completed and found accurate it is sealed under

100 ton,50 foot track scale under
construction at Napa Jction,Cal, Dec,1916
G.A.E.S.P.Co.

Installing a railroad track scale.

the authority of this department. There is no weighing apparatus today employed by the carriers that has not been inspected and sealed, which is a guarantee of its accuracy. All persons who do the weighing are seriously admonished that they must read the beam accurately and make a true record of such weight, thereby safeguarding the public to the extent of protecting them against false weights forming the basis of tariff charges.

This department has obtained and enjoys the fullest co-operation of the carriers and their weight bureaus and I conscientiously contend that the weighing apparatus employed by the carriers in the state of California is of satisfactory type and of uniform accuracy, and this department will diligently make the maintenance of this condition its constant future concern.

The following report will show to what extent the service has been developed:

REPORT FOR 1917.

Scales repaired and tested at stations on northern district and divisions as below with scale repair cars during 1917.

	Scales
Western division	284
Sacramento division	244
Shasta division	58
Portland division	218
Salt Lake division	77
Total scales repaired and tested by scale repair cars	881

Report of track scales tested on Northern District with scale test car during year 1917.

	Scales
Western division	61
Sacramento division	29
Portland division	17
Shasta division	18
Salt Lake division	18
Total track scales tested during 1917	143

Report of portable and dormant scales rebuilt and supplied to stations on the divisions as below during 1917.

	Scales
Western division	51
Sacramento division	49
Shasta division	10
Portland division	32
Salt Lake division	10
Scales on hand ready for shipment	25
Total scales rebuilt at scale shop during 1917	177

Track scales rebuilt during 1917 and installed:

Track scales rebuilt during 1917	6
New track scales installed during 1917	4
Track scales ready for installing, waiting for concrete work	3

Track scales inspected and tested with railroad scale test cars from January 1 to November 30, 1918, by Geo. A. Easton and assistants:

Track scales tested and owned by Southern Pacific Company	101
Private industrial scales tested	187
Track scales owned by other railroads in California inspected and tested:	
McCloud River Railroad, location, McCloud	2
Iron Mountain Railroad, location, Keswick	2
Sacramento Northern, location, Sacramento and Yuba City	8
North Western Pacific Railroad, location, on line	12
United Railroads, location, San Francisco	2
Ocean Shore Railroad, location, San Francisco	2
Yosemite Valley Railroad, location, Merced	2
Pacific Electric Railroad of Los Angeles, location, on line	28
Trona Railroad, location, Trona	3
San Joaquin and Eastern Railroad, location, on line	2
Cement, Tolenas and Tidewater Railroad, location, Cement	2
Total track scales inspected and tested from January 1 to November 30, 1918	353

New track scales installed, capacity from 100 to 150 tons, and owned by Southern Pacific Company stations as follows, from January 1 to November 30, 1918:

Lemoore	100 ton fifty foot	1
San Pedro	100 ton fifty foot	1
Chino	100 ton fifty foot	1
Hamilton	100 ton fifty foot	1
Roseville	150 ton fifty foot	1
Roseville	100 ton fifty foot	1
Chico	100 ton fifty foot	1
Niles	100 ton fifty foot	1
Total new track scales installed by Southern Pacific Company		8

Private industrial scales rebuilt from January 1 to November 30, 1918:

Location	Owners		
Kennett	Mammoth Mining Copper Company	100 ton 50 foot	2
Keswick	Iron Mountain Railroad	100 ton 50 foot	1
Yuba City	Sacramento Northern	100 ton 50 foot	1
Sacramento	California Winery	60 ton 42 foot	1
Hobart Mills	Sierra New Wood and Lumber Company	100 ton 50 foot	1
Flint	Pacific Portland Cement Company	100 ton 50 foot	1
Alvarado	Alameda Sugar Company	80 ton 42 foot	1
Stockton	Sperry Flour Company	100 ton 50 foot	1
San Pedro	Outer Harbor Company	100 ton 50 foot	1
South San Francisco	California Iron Works	150 ton 50 foot	1
Camp Fremont	U. S. Government	100 ton 50 foot	1
Camp Kearny	U. S. Government	100 ton 50 foot	1
Selby	Selby Smelting Company	100 ton 50 foot	1
Hercules	Hercules Powder Company	150 ton 50 foot	1
Nichols	General Chemical Company	100 ton 50 foot	1
Total new private scales installed from January 1 to November 30, 1918			16

Dormant and portable depot scales inspected, repaired and tested from January 1 to November 30, 1918, capacity from 500 to 30,000 pounds.

Scales inspected, repaired and tested, January, 1918	104
Scales inspected, repaired and tested, February, 1918	84
Scales inspected, repaired and tested, March, 1918	157
Scales inspected, repaired and tested, April, 1918	168
Scales inspected, repaired and tested, May, 1918	152
Scales inspected, repaired and tested, June, 1918	128
Scales inspected, repaired and tested, July, 1918	90
Scales inspected, repaired and tested, August, 1918	97
Scales inspected, repaired and tested, September, 1918	132
Scales inspected, repaired and tested, October, 1918	116
Scales inspected, repaired and tested, November, 1918	85
Total scales inspected, repaired and tested with scale repair cars at stations in California, from January 1 to November 30	1,313

Loading of cars without first weighing the cars light and taking the marked car tare is responsible for many controversies. This hoped for service may be extended to permit of tare weighing of all freight cars every six months and that each freight car be equipped with a convenient device to permit of record being attached to the car each time that it is weighed light, together with the date of such weighing.

I am pleased to acknowledge the excellent and satisfactory working relations with the railroad scale repair organizations and particularly to George A. Easton for his personal efforts to co-operate with the policy and recommendations of the department.

AUTOMATIC MEASURING PUMPS.

There are 344,000 motor vehicles operated in the state of California by gasoline and distillate. The quantity of these products used for motoring purposes is approximately one million gallons per day, and this vast amount of gasoline and distillate is measured to the public by automatic measuring devices commonly known as gasoline pumps. The demand for this product has developed hundreds of supply stations under the control of the large refining companies and private owners in every city, village and hamlet throughout the state, and each one of these supply stations is equipped with one or more automatic measuring pumps, as well as other liquid capacity measures.

Approximately nine thousand automatic gasoline pumps are employed in the state, for the accuracy of which this service assumes responsibility. For many years the construction of this type of apparatus was a matter of experiment. Many varieties were installed, which soon proved their uselessness, and it was only after the promulgation of national specifications adopted and enforced by this department, that the construction was of a character that would measure accurately and maintain an accurate delivery for a period of time. However, the latest designs and most perfect types require constant inspection. In San Francisco, Los Angeles and Alameda counties the local departments confine the inspection of this type of apparatus to men specially trained and thoroughly familiar with its construction, and they are able to make corrections and adjustments which obviate the necessity for many condemnations. Tolerances have been prepared and are in force, which cover the inspection. This type of apparatus and their employment throughout the state is uniformly efficient as respecting their accuracy.

Every gasoline pump in the state is tested and must be accurate.

Under date of December 28, 1916, I forwarded to the weights and measures officials throughout the state long and detailed instructions covering the practical inspection and testing of automatic measuring pumps and on several subsequent dates directed their special attention to the inspection of certain features of the apparatus.

DRAINAGE OF DISCHARGE APPLIANCE.

Under date of February 6, 1918, I prepared specifications to the effect that all measuring pumps used for the sale of gasoline should be so constructed as to provide for a complete and rapid drainage to a definite and uniform level of the liquid contained in the hose or outlet pipe. These specifications were to be construed to require that hose, if used, should be of such length and stiffness and its inlet end at such height above the normal level of its discharge end, when used for the purpose of delivery to an automobile fuel tank, that no portion of the hose would be disposed in such a way as to tend to retain liquid after the operation of the pump was completed.

Another specification promulgated was to the effect that all liquid measuring pumps should be so designed and constructed that they will not permit of a siphoning or a continuous trickle of liquid from the discharge outlet after the operation of the mechanism was discontinued. All liquid measuring pumps equipped with a standpipe should be furnished with a vacuum-breaker or equivalent device adapted to cause a definite and rapid drainage of the downcoming portions in the hose.

The practical application of these specifications were calculated to effect a more accurate delivery of liquid, and minimize the possibility of error in the employment of the measuring pumps.

These specifications were recommended, due to a great number of complaints, which upon investigations were sustained to the effect that the nondrainage of the hose facilitated the perpetration of false measuring. Every automatic gasoline measuring device, as well as all other measures employed at service stations, garages, and gasoline distributing plants, throughout the state, have been inspected two or more times during each year, and in the larger cities every three months. All complaints coming to the attention of the officials have had their earliest possible attention, and the conditions complained of rectified.

The construction of this type of apparatus permits of it being repaired, and in most cases where it has been condemned, convenient time has been extended, permitting of it being repaired.

Reports of investigations and inspections of this type of measuring device shows that the weights and measures officials are particularly vigilant in their concern over their accuracy, and I venture to say that these measuring devices in the state of California are maintained and operated with the highest uniform degree of accuracy possible.

It is impossible to determine the exact value of this service as a saving to the public. I do not hesitate to contend that the inspection has resulted in preventing error in the amount of one-half ounce to each gallon, which means a saving to the people of $285,154.70 per annum.

APPARATUS INSPECTED, 1917.

Scales.

County	Counter				Spring			
	Sealed	Corrected	Out of order	Condemned and confiscated	Sealed	Corrected	Out of order	Condemned and confiscated
Alameda	903	413	168	92	1,090	441	189	115
Alpine	-------	-------	-------	-------	-------	-------	-------	-------
Amador	91	6	24	6	26	0	6	92
Butte	183	49	17	6	138	18	11	52
Calaveras	37	0	0	2	22	2	0	4
Colusa	82	1	1	0	37	2	0	0
Contra Costa	88	40	5	2	57	9	9	11
Del Norte	23	0	0	0	1	0	0	0
El Dorado	56	34	0	2	14	4	0	5
Fresno	940	199	52	32	331	70	37	162
Glenn	53	12	0	0	10	1	0	0
Humboldt	110	107	0	0	38	37	0	8
Imperial	151	38	2	6	40	18	9	32
Inyo	11	2	0	0	5	2	0	1
Kern	79	12	5	9	82	13	0	14
Kings	131	28	5	7	30	5	2	9
Lake	28	6	1	0	1	0	1	0
Lassen	95	1	1	0	8	2	0	3
Los Angeles	1,715	925	90	100	4,407	2,465	95	824
Madera	14	2	2	0	2	3	0	1
Marin	156	67	10	12	156	52	5	13
Mariposa	9	1	1	0	1	1	3	2
Mendocino	113	6	0	3	82	0	0	12
Merced	29	7	1	2	7	1	2	3
Modoc	52	25	0	0	7	2	0	3
Mono	11	6	0	0	6	1	0	0
Monterey	19	5	0	3	29	8	1	17
Napa	58	11	0	0	7	0	0	4
Nevada	80	37	3	0	28	18	1	5
Orange	146	36	12	11	126	27	2	29
Placer	47	22	3	4	15	18	1	5
Plumas	49	8	0	1	3	0	0	2
Riverside	71	22	1	7	29	28	3	39
Sacramento	454	101	39	9	601	88	32	83
San Benito	13	5	2	0	10	0	2	5
San Bernardino	231	19	3	0	116	4	0	5
San Diego	746	92	28	28	1,018	47	17	67
San Francisco	2,613	1,285	256	68	6,424	1,958	627	93
San Joaquin	242	52	6	9	187	21	11	19
San Luis Obispo	130	34	0	9	68	38	0	49
San Mateo	289	115	5	1	149	31	58	41
Santa Barbara	228	57	1	1	58	17	0	3
Santa Clara	171	57	30	8	115	7	8	10
Santa Cruz	197	45	16	0	252	94	43	15
Shasta	125	87	0	1	55	8	1	6
Sierra	25	13	0	0	2	0	0	2
Siskiyou	256	48	8	5	12	0	23	5
Solano	123	35	8	2	58	6	7	22
Sonoma	375	22	7	11	156	17	6	14
Stanislaus	371	61	16	6	510	20	95	23
Sutter	18	4	0	2	7	1	0	6
Tehama	133	1	6	3	39	0	6	4
Trinity	44	0	0	0	9	0	0	0
Tulare	191	43	11	9	55	8	49	9
Tuolumne	45	41	4	2	14	12	3	5
Ventura	112	22	1	3	48	16	3	19
Yolo	79	6	0	0	45	5	0	1
Yuba	19	11	1	2	14	5	0	0

APPARATUS INSPECTED, 1917.

Scales.

County	Computing				Platform			
	Sealed	Corrected	Out of order	Condemned and confiscated	Sealed	Corrected	Out of order	Condemned and confiscated
Alameda	2,589	1,531	420	18	2,123	1,209	496	86
Alpine	--------	--------	--------	--------	--------	--------	--------	--------
Amador	26	17	4	0	154	17	23	53
Butte	134	43	7	0	369	159	20	4
Calaveras	27	3	0	0	41	6	0	0
Colusa	54	1	3	0	160	43	5	0
Contra Costa	170	54	3	0	163	147	26	2
Del Norte	15	0	0	0	22	1	0	0
El Dorado	28	16	2	0	75	65	2	0
Fresno	1,019	263	143	17	1,556	767	357	48
Glenn	56	27	1	0	104	52	10	0
Humboldt	230	227	0	0	244	241	0	6
Imperial	230	159	18	4	245	145	16	2
Inyo	18	4	0	0	30	9	0	0
Kern	198	59	9	6	315	180	20	10
Kings	112	44	5	0	225	84	16	3
Lake	23	7	0	0	57	7	1	0
Lassen	39	1	0	1	118	11	6	0
Los Angeles	2,613	3,011	237	29	1,414	2,739	298	103
Madera	21	11	1	0	36	17	5	0
Marin	327	124	13	4	248	85	5	3
Mariposa	2	1	0	0	7	7	8	0
Mendocino	126	2	1	2	190	8	4	7
Merced	19	7	2	0	162	70	29	4
Modoc	43	22	0	3	56	32	0	0
Mono	6	6	0	0	15	10	0	0
Monterey	39	16	0	0	160	208	29	5
Napa	30	13	0	0	62	10	0	0
Nevada	76	36	9	0	88	44	2	0
Orange	376	158	62	0	434	235	30	20
Placer	41	42	1	0	61	121	5	0
Plumas	34	14	0	0	39	4	0	1
Riverside	189	91	11	6	289	137	23	7
Sacramento	755	187	80	5	787	220	138	12
San Benito	17	3	4	1	34	25	6	0
San Bernardino	266	24	2	1	209	33	4	0
San Diego	896	370	99	9	1,000	369	94	12
San Francisco	2,829	224	354	17	2,714	1,650	798	695
San Joaquin	351	110	11	6	687	208	72	29
San Luis Obispo	116	70	0	2	243	158	0	4
San Mateo	348	156	27	2	576	346	66	2
Santa Barbara	189	48	1	1	255	149	3	3
Santa Clara	139	107	47	2	252	200	63	4
Santa Cruz	211	78	8	0	436	191	26	1
Shasta	90	34	2	1	237	180	0	0
Sierra	27	17	2	0	31	11	0	2
Siskiyou	117	49	2	0	222	77	34	2
Solano	134	84	27	4	148	135	47	11
Sonoma	350	60	16	0	636	97	13	7
Stanislaus	329	72	8	4	837	226	67	26
Sutter	28	2	0	0	76	70	21	9
Tehama	66	4	0	0	174	11	2	3
Trinity	19	0	0	0	28	0	0	0
Tulare	280	70	4	0	585	176	41	1
Tuolumne	55	58	3	1	50	42	17	11
Ventura	96	38	2	0	200	86	5	2
Yolo	14	5	0	0	259	53	18	0
Yuba	12	8	1	0	83	37	12	1

APPARATUS INSPECTED, 1917.

County	Weights				Measures, linear			
	Sealed	Corrected	Out of order	Condemned and confiscated	Sealed	Corrected	Out of order	Condemned and confiscated
Alameda	8,444	1,606	651	319	842	85	114	57
Alpine								
Amador	1,022	32	42	90	53	13	0	10
Butte	1,766	231	0	72	2	1	0	0
Calaveras	241	40	0	6	0	0	0	0
Colusa	1,021	8	0	27	43	0	0	0
Contra Costa	1,395	99	3	6	65	10	0	0
Del Norte	283	6	0	0	17	3	0	0
El Dorado	415	33	0	39	2	2	0	0
Fresno	7,380	460	62	151	132	4	0	8
Glenn	483	66	0	58	24	1	0	0
Humboldt	899	899	0	47	873	688	0	0
Imperial	702	8	8	29	54	1	0	75
Inyo	124	4	0	0	1	0	0	0
Kern	910	187	0	56	210	31	0	9
Kings	945	81	0	47	8	1	0	0
Lake	313	16	0	24	10	0	0	0
Lassen	596	52	0	16	32	4	0	0
Los Angeles	23,476	171	55	204	742	2	0	138
Madera	219	6	0	6	0	0	0	0
Marin	1,235	216	0	29	65	0	0	19
Mariposa	50	7	7	0	0	0	0	0
Mendocino	894	44	0	48	39	3	0	5
Merced	548	96	0	22	5	4	0	1
Modoc	322	8	0	4	35	0	0	0
Mono	77	44	0	0	6	5	0	0
Monterey	1,018	198	3	5	0	0	0	0
Napa	300	13	0	18	11	10	0	0
Nevada	743	16	0	4	68	0	0	0
Orange	17	5	0	15	82	57	18	1
Placer	703	199	0	19	6	6	1	0
Plumas	257	47	0	2	0	0	0	0
Riverside	1,025	59	0	2	13	0	0	0
Sacramento	3,342	96	0	117	19	0	0	4
San Benito	309	3	0	5	22	0	0	0
San Bernardino	984	3	0	3	103	164	1	0
San Diego	8,535	345	0	91	1,000	0	0	46
San Francisco	17,204	1,872	0	1,359	21,227	0	0	0
San Joaquin	3,598	158	0	160	4	0	0	0
San Luis Obispo	1,262	238	0	28	0	0	0	6
San Mateo	3,926	349	0	28	49	0	0	0
Santa Barbara	1,869	175	0	2	154	0	0	0
Santa Clara	1,388	366	0	59	0	0	0	0
Santa Cruz	2,148	514	0	11	17	3	1	0
Shasta	1,352	21	0	12	25	3	0	0
Sierra	187	3	0	0	9	7	0	0
Siskiyou	1,253	21	0	168	18	4	0	1
Solano	1,086	25	0	39	22	18	2	3
Sonoma	3,549	21	0	70	0	0	0	0
Stanislaus	10,280	59	210	95	31	0	4	0
Sutter	513	47	0	3	2	0	0	0
Tehama	1,090	1	0	5	81	0	0	0
Trinity	380	0	0	0	17	0	0	0
Tulare	2,815	127	0	53	0	0	0	0
Tuolumne	259	135	0	17	54	27	0	0
Ventura	1,156	86	0	27	12	0	0	0
Yolo	1,140	45	0	8	13	1	0	0
Yuba	365	44	0	131	0	0	0	0

APPARATUS INSPECTED, 1917.

County	Measures, liquid				Measuring pumps			
	Sealed	Corrected	Out of order	Condemned and confiscated	Sealed	Corrected	Out of order	Condemned and confiscated
Alameda	2,337	150	68	437	510	261	73	1
Alpine	------	------	------	------	------	------	------	------
Amador	465	0	3	72	18	12	0	0
Butte	231	3	6	8	75	39	8	2
Calaveras	172	0	0	9	9	0	1	0
Colusa	368	1	0	0	45	22	2	0
Contra Costa	311	0	4	41	53	28	28	0
Del Norte	138	0	0	1	13	2	0	0
El Dorado	275	0	0	53	31	15	0	0
Fresno	2,301	108	39	150	556	222	85	1
Glenn	391	0	1	12	30	18	5	0
Humboldt	801	724	0	53	65	62	0	0
Imperial	291	1	1	59	121	79	10	0
Inyo	26	2	0	4	2	1	0	0
Kern	715	0	0	73	263	99	11	2
Kings	179	2	14	18	81	37	4	0
Lake	91	0	0	0	20	7	1	0
Lassen	130	0	0	13	21	3	0	0
Los Angeles	5,830	101	31	370	1,053	700	190	0
Madera	93	0	0	0	22	12	1	0
Marin	780	2	0	30	239	123	13	0
Mariposa	8	0	0	0	3	2	2	1
Mendocino	184	0	0	27	62	7	2	0
Merced	117	3	0	25	42	26	4	0
Modoc	67	0	0	8	24	11	4	0
Mono	31	0	0	3	4	2	0	0
Monterey	278	17	0	18	39	25	2	0
Napa	42	0	9	3	19	3	0	0
Nevada	401	0	0	11	23	17	0	0
Orange	292	1	4	3	189	99	60	9
Placer	230	1	0	58	31	38	8	0
Plumas	67	0	0	8	8	1	0	0
Riverside	450	54	15	44	125	71	17	3
Sacramento	2,080	0	0	250	199	54	23	0
San Benito	33	0	0	0	10	3	1	0
San Bernardino	653	4	1	10	172	5	5	0
San Diego	5,525	4	51	69	315	549	80	0
San Francisco	8,012	0	11	404	829	127	68	0
San Joaquin	1,613	19	0	76	185	124	29	1
San Luis Obispo	206	0	0	36	83	42	0	0
San Mateo	2,169	0	36	93	911	210	88	0
Santa Barbara	560	0	0	0	163	69	0	1
Santa Clara	392	0	0	12	124	143	0	0
Santa Cruz	752	19	15	13	188	67	21	0
Shasta	639	1	0	3	55	10	1	0
Sierra	53	0	0	1	14	11	0	0
Siskiyou	145	0	6	8	42	15	6	0
Solano	158	3	0	29	31	24	6	0
Sonoma	691	0	0	7	170	15	1	0
Stanislaus	1,509	4	41	47	212	52	9	1
Sutter	16	0	0	4	14	0	1	0
Tehama	571	0	0	0	58	5	0	0
Trinity	82	0	0	0	1	1	0	0
Tulare	1,144	1	77	45	245	121	23	0
Tuolumne	120	0	5	6	27	22	5	0
Ventura	1,062	1	0	80	86	33	7	0
Yolo	343	0	0	5	95	11	0	0
Yuba	66	0	0	2	25	9	0	0

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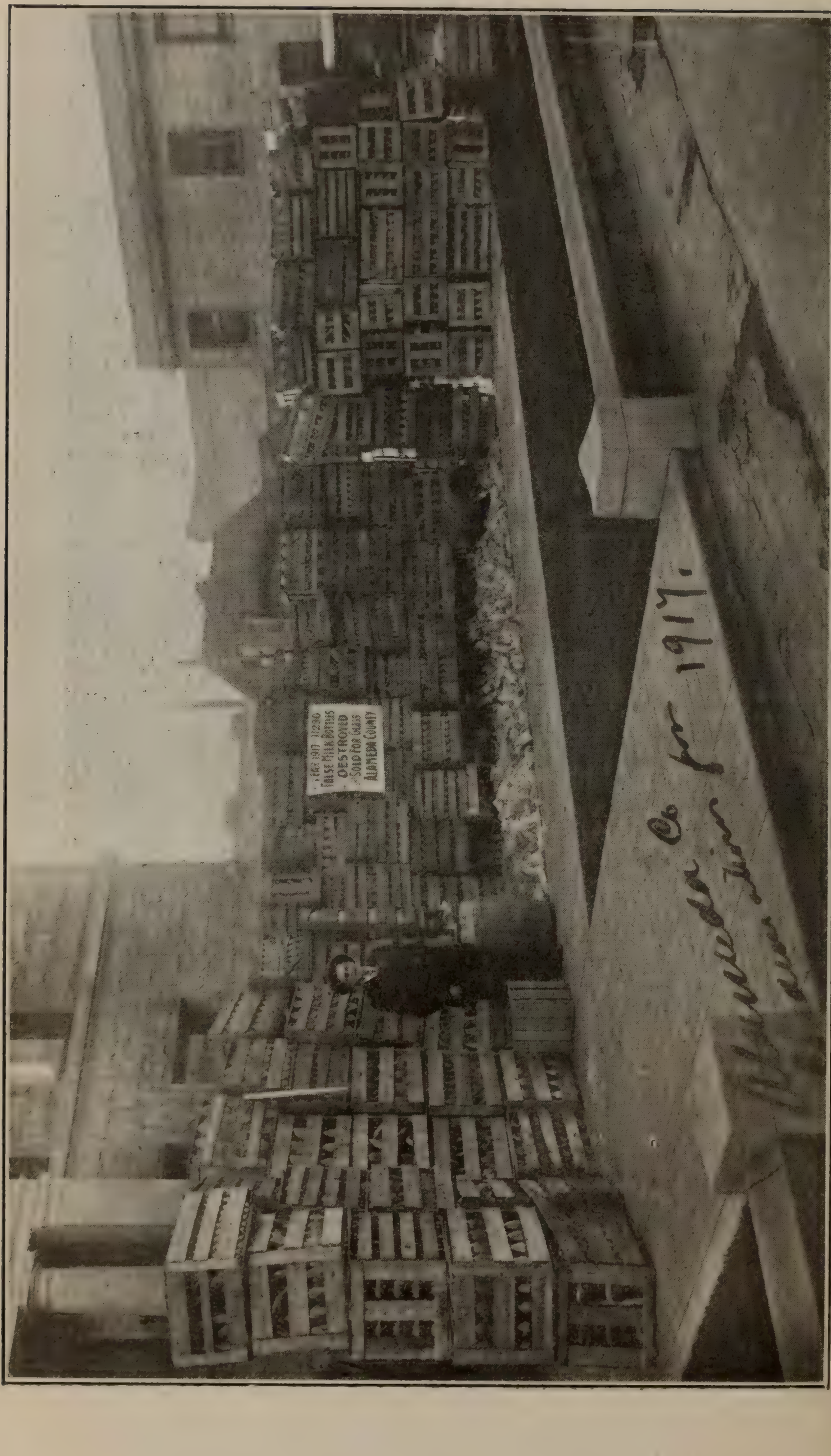
County	Milk bottles				Miscellaneous			
	Inspected	Minus	Plus	Condemned and confiscated	Sealed	Corrected	Out of order	Condemned and confiscated
Alameda	374,985	0	0	7,248	0	0	0	0
Alpine	----------	--------	--------	--------	--------	--------	--------	--------
Amador	175	0	0	0	0	0	0	0
Butte	4,275	0	0	8	7	1	0	0
Calaveras	0	0	0	0	0	0	0	0
Colusa	4,188	72	144	0	0	0	0	0
Contra Costa	132	0	0	2	18	12	4	4
Del Norte	218	0	0	0	0	0	0	0
El Dorado	25	0	0	0	0	0	0	0
Fresno	96,378	0	0	0	136	41	16	5
Glenn	1,741	0	0	68	6	0	2	0
Humboldt	206	0	0	21	0	0	0	0
Imperial	2,296	170	440	11	0	0	0	0
Inyo	144	0	0	12	3	2	0	0
Kern	2,110	358	0	358	0	0	0	0
Kings	1,150	0	0	0	3	2	0	0
Lake	0	0	0	0	4	3	2	0
Lassen	2,276	0	0	0	4	0	0	0
Los Angeles	766,488	0	0	6,237	42	129	12	29
Madera	1,000	0	0	0	3	2	1	0
Marin	100,444	544	0	545	419	0	0	0
Mariposa	0	0	0	0	0	0	0	0
Mendocino	0	0	0	0	0	0	0	0
Merced	0	0	0	0	0	0	0	0
Modoc	0	0	0	0	0	0	0	0
Mono	0	0	0	0	0	0	0	0
Monterey	1,296	9	0	0	3	2	0	1
Napa	2,018	5	0	5	0	0	0	0
Nevada	180	0	0	0	0	200	0	0
Orange	28,213	0	0	3,096	5	2	1	0
Placer	968	20	0	23	4	1	1	0
Plumas	18	0	0	0	0	0	0	0
Riverside	268	264	0	4	0	0	0	0
Sacramento	39,921	0	0	144	0	0	0	0
San Benito	0	0	0	0	0	0	0	0
San Bernardino	4,229	0	0	0	0	0	0	0
San Diego	227,972	91,558	104,890	276	4	0	0	0
San Francisco	6,497,339	0	0	6,750	0	0	0	0
San Joaquin	47,456	0	0	2,556	2	5	0	0
San Luis Obispo	5,250	125	0	125	14	2	0	0
San Mateo	44,905	0	0	0	0	0	0	0
Santa Barbara	26,000	0	0	0	14	3	0	0
Santa Clara	0	0	0	0	0	0	0	0
Santa Cruz	6,301	911	920	102	21	8	1	0
Shasta	2,107	0	0	4	0	0	0	0
Sierra	0	0	0	0	0	0	0	0
Siskiyou	40	0	0	0	0	0	0	0
Solano	2,923	31	19	2,373	0	0	0	0
Sonoma	2,067	0	0	167	0	0	0	0
Stanislaus	41,137	206	0	838	261	0	0	0
Sutter	0	0	0	0	0	0	0	0
Tehama	612	0	0	0	0	0	0	0
Trinity	0	0	0	0	580	1	0	0
Tulare	0	0	0	0	0	0	0	0
Tuolumne	112	5	0	0	0	0	0	2
Ventura	1,630	0	0	0	0	0	0	0
Yolo	1,391	0	0	30	0	0	0	0
Yuba	0	0	0	0	5	1	1	0

APPARATUS INSPECTED, 1917.

County	Containers or packages inspected			Complaints				
	Heavy	Correct	Light	Prosecutions	Convictions	Acquittals	Cases pending	Otherwise disposed of
Alameda	7,014	21,669	28,671	3	3	0	0	730
Alpine	---	---	---	---	---	0	0	0
Amador	16	229	199	0	0	0	0	86
Butte	734	3,839	663	0	0	0	0	117
Calaveras	0	56	0	0	0	0	0	32
Colusa	198	2,079	288	0	0	0	0	86
Contra Costa	14	59	19	0	0	0	0	194
Del Norte	18	251	29	0	0	0	0	37
El Dorado	1	30	26	0	0	0	0	28
Fresno	1,936	12,840	2,265	6	3	1	2	272
Glenn	186	1,109	122	0	0	0	0	74
Humboldt	387	21,419	205	0	0	0	0	108
Imperial	881	754	550	0	0	0	0	65
Inyo	0	9	0	0	0	0	0	32
Kern	35	8,640	480	0	0	0	0	127
Kings	10	1,383	41	2	2	0	0	149
Lake	38	965	154	0	0	0	0	40
Lassen	0	1,001	42	0	0	0	0	22
Los Angeles	15,156	6,240	9,123	54	53	1	0	2,264
Madera	0	0	0	0	0	0	0	84
Marin	0	91,400	2,618	0	0	0	0	92
Mariposa	0	10	0	0	0	0	0	24
Mendocino	31	389	65	0	0	0	0	68
Merced	1,050	1,288	130	0	0	0	1	129
Modoc	114	1,238	73	0	0	0	0	114
Mono	18	353	131	0	0	0	0	22
Monterey	1,861	5,273	448	3	2	0	1	85
Napa	51	2,054	0	0	0	0	0	14
Nevada	411	2,119	72	0	0	0	0	74
Orange	15	920	1,300	8	7	1	0	203
Placer	881	19,810	411	0	0	0	0	64
Plumas	0	0	0	0	0	0	0	27
Riverside	0	167	153	1	1	0	0	150
Sacramento	40	5,408	1,231	11	7	1	0	210
San Benito	1	27	1	0	0	0	0	32
San Bernardino	0	20,064	1,010	6	3	1	2	108
San Diego	9,203	18,044	8,907	6	4	2	1	311
San Francisco	0	71,846	7,709	283	271	6	0	2,199
San Joaquin	314	3,276	2,242	5	4	1	0	232
San Luis Obispo	31	3,067	531	9	3	1	5	84
San Mateo	7,525	209,405	6,730	0	0	0	0	112
Santa Barbara	35	210	914	0	0	0	2	145
Santa Clara	187	548	298	2	2	0	0	260
Santa Cruz	50	1,534	594	0	0	0	0	65
Shasta	12	261	40	0	0	0	0	34
Sierra	0	0	0	0	0	0	0	75
Siskiyou	14	179	128	1	1	0	0	64
Solano	401	4,775	395	2	2	0	0	108
Sonoma	0	4,981	0	0	0	0	0	196
Stanislaus	781	7,419	3,603	1	0	0	4	201
Sutter	0	379	1,287	0	0	0	0	42
Tehama	17	548	12	0	1	0	1	114
Trinity	13	112	8	0	0	0	0	36
Tulare	0	300	0	0	0	0	0	95
Tuolumne	13	274	17	1	1	0	0	32
Ventura	247	1,515	75	0	0	0	0	101
Yolo	0	1,351	42	0	0	0	0	106
Yuba	8	0	1	0	0	0	0	51

Four thousand eight hundred false weight and measures, destroyed and sold for junk in Alameda County during 1917. Edward K. Strowbridge, Sealer.



Eleven thousand two hundred ninety false milk bottles, broken and sold for glass in Alameda County during 1917.
Edward K. Strowbridge, Sealer.

APPARATUS INSPECTED, 1918.

Scales.

County	Counter				Spring			
	Sealed	Corrected	Out of order	Condemned and confiscated	Sealed	Corrected	Out of order	Condemned and confiscated
Alameda	1,192	731	197	61	1,284	662	289	112
Amador	39	10	0	2	9	0	0	0
Butte	134	39	4	3	107	25	4	40
Calaveras	56	39	0	2	21	4	0	1
Colusa	59	0	0	0	18	0	0	0
Contra Costa	62	4	3	1	48	8	4	2
Del Norte	9	9	0	0	0	0	0	0
El Dorado	66	48	3	1	15	8	8	11
Fresno	952	219	295	10	268	65	23	34
Glenn	27	0	1	0	19	0	0	0
Humboldt	64	54	0	1	18	12	2	2
Imperial	39	9	0	4	21	12	4	13
Inyo	53	18	3	0	4	3	1	1
Kern	143	27	0	4	72	8	0	77
Kings	79	34	6	1	7	1	3	6
Lake	27	0	0	0	5	1	0	0
Lassen	2	0	0	0	0	0	0	1
Los Angeles	1,685	741	96	56	3,574	2,069	83	424
Madera	38	14	4	4	15	2	1	9
Marin	123	56	4	5	127	47	1	15
Mariposa	41	13	0	1	4	1	2	2
Mendocino	98	11	0	2	82	1	0	22
Merced	28	11	4	5	15	9	1	1
Modoc	36	10	0	0	4	4	0	0
Mono	11	6	0	0	6	1	0	1
Monterey	58	19	3	2	69	16	0	9
Napa	60	19	0	0	12	6	0	10
Nevada	70	19	0	1	19	9	0	0
Orange	116	46	8	9	99	20	2	16
Placer	72	31	1	3	8	9	1	6
Plumas	---	---	---	---	---	---	---	---
Riverside	73	44	3	1	46	33	1	13
Sacramento	834	123	26	61	536	180	31	37
San Benito	15	23	0	0	6	5	0	2
San Bernardino	193	31	0	0	47	0	0	3
San Diego	702	153	7	2	1,083	49	0	23
San Francisco	2,192	424	108	24	2,794	223	144	748
San Joaquin	251	24	1	2	124	15	7	11
San Luis Obispo	76	14	0	0	61	22	0	13
San Mateo	124	99	8	5	102	37	14	19
Santa Barbara	241	63	0	3	71	25	0	15
Santa Clara	106	32	21	2	147	4	3	0
Santa Cruz	194	40	8	1	167	38	16	8
Shasta	125	63	1	0	43	3	0	1
Sierra	---	---	---	---	---	---	---	---
Siskiyou	98	4	4	0	4	0	0	0
Solano	126	21	11	4	37	9	1	5
Sonoma	350	21	4	1	111	16	3	8
Stanislaus	396	22	10	11	288	10	6	66
Sutter	94	12	1	1	4	0	0	3
Tehama	87	0	0	0	8	0	0	0
Trinity	---	---	---	---	---	---	---	---
Tulare	135	22	2	0	27	10	4	0
Tuolumne	41	28	0	0	22	4	0	8
Ventura	131	12	0	1	84	6	2	11
Yolo	45	1	1	0	43	0	0	0
Yuba	65	12	1	2	28	6	0	5

APPARATUS INSPECTED, 1918.

Scales.

County	Computing				Platform			
	Sealed	Corrected	Out of order	Condemned and confiscated	Sealed	Corrected	Out of order	Condemned and confiscated
Alameda	2,595	1,529	492	16	1,867	1,097	491	55
Amador	47	27	0	1	45	12	0	0
Butte	138	54	9	0	329	166	8	3
Calaveras	36	18	1	0	75	51	4	0
Colusa	47	4	0	0	145	5	7	0
Contra Costa	123	41	9	0	0	302	57	28
Del Norte	13	13	0	1	44	44	0	0
El Dorado	36	25	0	1	75	56	3	0
Fresno	799	279	138	0	1,446	775	293	68
Glenn	58	15	4	0	132	15	16	0
Humboldt	118	105	1	1	204	115	4	1
Imperial	47	38	2	2	83	49	8	0
Inyo	28	16	0	0	65	42	2	0
Kern	333	116	8	5	384	119	0	6
Kings	102	33	7	0	234	83	18	0
Lake	19	3	0	0	74	15	2	0
Lassen	2	0	0	0	8	5	0	0
Los Angeles	2,946	2,216	382	26	1,726	2,140	338	63
Madera	30	7	2	0	92	47	22	1
Marin	302	134	18	3	222	86	12	7
Mariposa	15	6	1	0	32	16	4	3
Mendocino	146	1	4	8	155	17	2	5
Merced	19	3	2	0	131	77	15	2
Modoc	42	7	0	0	61	26	0	1
Mono	6	3	0	0	18	11	0	0
Monterey	140	51	10	0	217	215	27	4
Napa	84	64	1	1	117	69	0	4
Nevada	66	35	0	0	73	39	0	0
Orange	352	218	34	3	421	295	15	7
Placer	41	44	4	0	72	105	2	1
Plumas	--------	--------	--------	--------	--------	--------	--------	--------
Riverside	121	92	5	1	302	282	44	5
Sacramento	325	148	43	2	452	206	78	9
San Benito	22	25	5	0	56	50	3	1
San Bernardino	363	32	0	0	257	77	0	0
San Diego	750	375	51	9	889	379	85	13
San Francisco	2,648	234	254	26	2,453	1,373	480	37
San Joaquin	311	81	17	6	627	151	47	10
San Luis Obispo	90	21	0	0	242	55	0	0
San Mateo	358	183	27	3	475	309	44	2
Santa Barbara	209	49	0	3	225	152	11	8
Santa Clara	224	59	21	1	231	319	33	0
Santa Cruz	270	85	18	0	420	177	41	0
Shasta	83	27	3	0	222	147	2	0
Sierra	--------	--------	--------	--------	--------	--------	--------	--------
Siskiyou	41	2	2	0	107	38	17	0
Solano	98	51	9	0	119	34	21	4
Sonoma	349	30	5	0	653	96	10	1
Stanislaus	362	95	6	6	829	279	55	38
Sutter	25	6	0	3	128	42	3	12
Tehama	62	0	0	0	121	0	0	0
Trinity	--------	--------	--------	--------	--------	--------	--------	--------
Tulare	223	76	0	0	376	100	37	1
Tuolumne	39	24	2	2	64	51	4	0
Ventura	124	26	2	1	281	111	13	5
Yolo	96	5	4	0	234	33	12	1
Yuba	55	48	0	2	119	18	7	6

APPARATUS INSPECTED, 1918.

County	Weights				Measures, linear			
	Sealed	Corrected	Out of order	Condemned and confiscated	Sealed	Corrected	Out of order	Condemned and confiscated
Alameda	9,598	3,863	365	565	164	29	12	24
Amador	289	1	0	1	7	0	0	0
Butte	1,486	128	0	29	0	0	0	1
Calaveras	322	156	0	163	2	0	0	0
Colusa	660	16	0	2	19	0	0	0
Contra Costa	0	1,512	158	4	28	0	1	0
Del Norte	148	148	0	22	68	68	0	0
El Dorado	369	137	0	27	0	0	0	0
Fresno	8,082	337	459	91	9	4	2	0
Glenn	465	45	2	10	5	0	0	0
Humboldt	908	430	0	14	495	66	0	0
Imperial	150	18	0	1	10	0	0	6
Inyo	224	0	0	0	4	0	0	3
Kern	1,084	161	0	12	96	12	0	41
Kings	919	46	0	25	8	0	0	0
Lake	318	19	0	0	2	2	0	0
Lassen	27	0	0	0	0	0	0	9
Los Angeles	22,062	301	71	164	507	4	0	148
Madera	387	14	0	31	0	0	0	0
Marin	1,102	94	0	17	37	0	0	9
Mariposa	249	45	0	13	0	0	0	0
Mendocino	590	23	0	52	33	4	0	9
Merced	481	38	0	46	0	0	0	0
Modoc	389	1	0	1	21	0	0	0
Mono	92	13	0	11	0	0	0	0
Monterey	1,312	87	0	34				
Napa	757	42	0	2	24	0	0	0
Nevada	517	10	0	23	29	0	0	0
Orange	12	8	5	5	1	0	0	0
Placer	921	54	0	18	6	3	0	1
Plumas								
Riverside	1,291	285	0	13	12	5	0	4
Sacramento	2.257	5	0	2	0	0	0	0
San Benito	382	5	0	2	0	0	0	0
San Bernardino	1,211	0	0	0	249	0	0	0
San Diego	8,418	61	0	55	805	90	0	31
San Francisco	20,444	701	11	841	0	0	0	0
San Joaquin	4,085	28	3	227	4	4	0	1
San Luis Obispo	894	7	0	56	0	0	0	0
San Mateo	3,526	895	0	6	10	0	0	0
Santa Barbara	2,175	51	0	2	51	0	0	0
Santa Clara	1,333	217	19	0	0	0	0	0
Santa Cruz	2,065	292	0	12	11	0	0	0
Shasta	1,427	19	0	21	75	0	0	0
Sierra								
Siskiyou	748	36	0	15	2	0	0	6
Solano	821	0	0	35	0	2	0	0
Sonoma	3,461	10	0	3	92	0	0	0
Stanislaus	3,791	64	205	183	28	1	0	2
Sutter	502	67	0	10	6	3	0	0
Tehama	962	2	0	1	22	0	0	0
Trinity								
Tulare	2,210	14	0	93	0	0	0	0
Tuolumne	343	211	0	71	18	12	0	0
Ventura	1,941	71	26	29	16	2	0	0
Yolo	1.106	2	0	3	4	0	0	0
Yuba	497	48	0	12	4	3	0	0

APPARATUS INSPECTED, 1918.

County	Measures, liquid				Measuring pumps			
	Sealed	Corrected	Out of order	Condemned and confiscated	Sealed	Corrected	Out of order	Condemned and confiscated
Alameda	2,783	606	270	340	686	318	157	6
Amador	53	0	0	3	38	18	1	0
Butte	224	2	0	7	96	26	6	0
Calaveras	320	1	0	49	14	8	1	0
Colusa	209	6	0	2	49	22	4	0
Contra Costa	236	2	1	10	47	32	7	0
Del Norte	94	94	--------	6	23	23	0	0
El Dorado	193	3	0	40	29	14	2	0
Fresno	2,524	10	53	76	614	228	147	2
Glenn	280	8	0	9	46	30	9	1
Humboldt	617	17	0	13	64	24	1	0
Imperial	91	1	1	16	40	22	2	6
Inyo	46	0	0	3	22	15	3	0
Kern	1,519	0	0	176	250	96	7	5
Kings	200	2	0	5	83	38	3	0
Lake	50	0	0	0	22	15	2	0
Lassen	14	0	0	0	7	6	0	0
Los Angeles	6.967	37	49	214	1,078	639	128	1
Madera	143	30	16	26	46	27	6	0
Marin	383	0	0	17	276	133	18	0
Mariposa	68	16	4	7	36	23	2	1
Mendocino	134	0	0	20	79	9	2	0
Merced	79	10	8	3	47	21	7	0
Modoc	52	0	0	1	30	14	0	0
Mono	21	0	0	0	5	5	0	0
Monterey	759	22	1	43	83	43	14	3
Napa	49	1	1	4	48	43	0	4
Nevada	110	0	0	0	27	15	0	0
Orange	18	3	0	8	196	101	33	1
Placer	403	1	1	44	77	56	9	0
Plumas	--------	--------	--------	--------	--------	--------	--------	--------
Riverside	537	47	21	11	123	99	8	3
Sacramento	868	63	33	121	143	65	38	0
San Benito	40	0	2	18	19	8	1	0
San Bernardino	937	0	0	0	235	221	35	0
San Diego	5,859	13	2	163	353	221	35	0
San Francisco	13,034	1	0	1,667	923	118	43	1
San Joaquin	1,591	33	6	39	259	100	24	0
San Luis Obispo	75	0	0	6	52	19	0	0
San Mateo	1,212	0	0	9	693	238	52	0
Santa Barbara	733	5	0	12	139	69	0	3
Santa Clara	340	0	0	16	285	111	34	0
Santa Cruz	1,046	26	16	8	212	42	33	0
Shasta	506	0	0	0	48	14	1	0
Sierra	--------	--------	--------	--------	--------	--------	--------	--------
Siskiyou	28	0	0	0	47	14	3	0
Solano	86	0	0	1	29	7	3	0
Sonoma	163	0	0	0	148	12	0	0
Stanislaus	719	1	2	57	164	48	12	2
Sutter	69	2	0	32	11	6	0	0
Tehama	433	0	0	0	56	2	0	0
Trinity	--------	--------	--------	--------	--------	--------	--------	--------
Tulare	1,132	1	0	29	199	76	9	0
Tuolumne	387	16	0	34	30	19	0	0
Ventura	1.100	0	2	19	115	43	45	0
Yolo	136	0	0	1	82	13	10	0
Yuba	128	3	0	18	18	11	1	0

APPARATUS INSPECTED, 1918.

County	Milk bottles				Miscellaneous			
	Inspected	Minus	Plus	Condemned and confiscated	Sealed	Corrected	Out of order	Condemned and confiscated
Alameda	319,656	0	0	1,944	34	14	4	0
Amador	0	0	0	0	0	0	0	0
Butte	5,437	5,437	0	0	0	0	0	0
Calaveras	0	0	0	0	0	0	0	0
Colusa	216	0	216	0	0	0	0	0
Contra Costa	234	9	12	5	25	10	2	0
Del Norte	0	0	0	0	0	0	0	0
El Dorado	86	0	0	8	0	0	0	0
Fresno	97.569	15,480	0	0	65	22	11	2
Glenn	542	0	542	0	0	0	0	0
Humboldt	1,112	0	0	0	0	0	0	0
Imperial	400	90	190	11	0	0	0	0
Inyo	100	0	0	0	0	0	0	0
Kern	12,126	0	0	1,8[illegible]5	0	0	0	0
Kings	4,992	7	1,168	1	0	0	0	0
Lake	0	0	0	0	0	0	0	0
Lassen	0	0	0	0	0	0	0	0
Los Angeles	407,020	0	0	30	93	163	8	2
Madera	0	0	0	0	0	0	0	0
Marin	73,200	319	0	319	98	54	6	0
Mariposa	125	0	0	0	5	0	0	0
Mendocino	289	0	0	2	0	0	0	0
Merced	0	0	0	0	3	0	0	0
Modoc	0	0	0	0	626	62	0	5
Mono	0	0	0	0	0	0	0	0
Monterey	3,888	0	0	0	6	8	3	4
Napa	1,750	50	200	0	0	0	0	0
Nevada	0	0	0	0	0	0	0	0
Orange	26,796	288	432	288	74	55	13	1
Placer	1,872	0	0	0	0	0	0	0
Plumas	-------	-------	-------	-------	-------	-------	-------	-------
Riverside	0	0	0	0	0	0	0	0
Sacramento	28,150	6	0	6	30	27	5	4
San Benito	0	0	25	0	0	0	0	0
San Bernardino	9,100	0	0	0	26	0	0	0
San Diego	257,375	134,591	122,785	0	15	1	1	0
San Francisco	2,386,109	0	0	434	0	0	0	0
San Joaquin	69,661	0	0	0	0	0	0	0
San Luis Obispo	0	0	0	0	7	0	0	2
San Mateo	28,525	0	0	0	0	0	0	0
Santa Barbara	22,700	0	0	0	0	0	0	0
Santa Clara	0	0	0	0	250	0	0	0
Santa Cruz	4,779	0	0	88	43	5	2	0
Shasta	1,224	0	0	2	0	0	0	0
Sierra	-------	-------	-------	-------	-------	-------	-------	-------
Siskiyou	0	0	0	0	16	0	0	0
Solano	151	4	5	9	9	1	1	0
Sonoma	100	0	0	0	0	0	0	0
Stanislaus	3,548	1,294	2,236	18	239	124	115	124
Sutter	0	0	0	0	0	0	0	0
Tehama	1,490	0	0	0	0	0	0	0
Trinity	-------	-------	-------	-------	-------	-------	-------	-------
Tulare	2,000	0	0	0	47	0	0	0
Tuolumne	134	0	0	23	0	0	0	0
Ventura	2.100	0	0	0	0	0	0	0
Yolo	1,200	0	0	0	17	0	0	0
Yuba	630	30	21	6	1	1	0	3

APPARATUS INSPECTED, 1918.

County	Containers or packages inspected			Complaints				
	Heavy	Correct	Light	Prosecutions	Convictions	Acquittals	Cases pending	Otherwise disposed of
Alameda	4,517	24,968	5,584	2	2	0	2	1,480
Amador	3	1,175	20	0	0	0	0	0
Butte	990	4,631	1,114	0	0	0	0	108
Calaveras	6	8,814	14	0	0	0	0	140
Colusa	45	1,003	50	0	0	0	0	65
Contra Costa	69	68	35	0	0	0	0	94
Del Norte	145	2,700	10	0	0	0	0	111
El Dorado	61	4,351	787	0	0	0	0	16
Fresno	[illegible]8,871	430,843	23,272	2	1	0	0	64
Glenn	55	1,629	101	0	0	0	1	307
Humboldt	1,112	12,376	169	1	0	0	0	85
Imperial	672	616	387	1	1	1	0	92
Inyo	52	66	83	0	0	0	0	116
Kern	25	15,200	4,395	0	0	0	0	61
Kings	2	6,034	252	1	1	0	0	138
Lake	114	785	127	0	0	0	0	163
Lassen	0	0	0	0	0	0	0	51
Los Angeles	1,987	17,134	8,985	47	42	0	0	36
Madera	201	723	108	0	0	5	0	2,314
Marin	6	61,9[illegible]0	943	0	0	0	0	105
Mariposa	44	56	33	0	0	0	0	69
Mendocino	3	299	205	0	0	0	0	57
Merced	54	363	29	0	0	0	0	112
Modoc	825	2,113	97	0	0	0	0	201
Mono	2	2,125	6	0	0	0	0	95
Monterey	159	15,940	942	1	1	0	0	44
Napa	5	1,464	1	0	0	0	0	116
Nevada	75	3,277	70	0	0	0	0	112
Orange	0	580	1,136	14	13	0	0	82
Placer	733	16,228	399	0	0	1	0	194
Plumas						0	0	98
Riverside	7	79	118	0	0			
Sacramento	1,114	12,279	8,952	1	0	0	0	182
San Benito	19	1,400	36	1	1	1	0	289
San Bernardino	0	16,423	0	3	3	0	0	61
San Diego	9,871	75,699	15,756	1	1	0	0	174
San Francisco	34	42,130	8,048	62	58	0	0	372
San Joaquin	17	978	100	2	2	4	0	2,454
San Luis Obispo	0	1,212	170	5	5	0	0	198
San Mateo	0	188,767	450	0	0	0	1	126
Santa Barbara	260	5,060	665	0	0	0	0	141
Santa Clara	17	16	108	0	0	0	0	19[illegible]
Santa Cruz	9	1,904	457	0	0	0	0	184
Shasta	12	332	34	0	0	0	0	91
Sierra						0	0	84
Siskiyou	39	105	37	0	0			
Solano	53	721	97	1	1	0	0	39
Sonoma	0	2,904	201	0	0	0	0	119
Stanislaus	860	7,243	1,729	29	5	0	0	142
Sutter	25	970	38	0	0	0	0	172
Tehama	0	0	0	0	0	0	0	109
Trinity						0	0	82
Tulare	0	783	0	1	1			
Tuolumne	24	4,472	106	0	0	0	0	109
Ventura	56	1,623	185	0	0	0	0	61
Yolo	9	2,077	361	0	0	0	0	94
Yuba	15	1,850	25	0	0	0	0	112
						0	0	110

COMPILATION OF INSPECTIONS, 1917 AND 1918.

	1917	1918
Total scales inspected	108,546	96,383
Total scales corrected	29,842	25,215
Total scales condemned for repair	6,917	5,658
Total scales confiscated	3,847	2,793
Total scales sealed	67,940	60,106
Miscellaneous	2,057	2,592
Total measures inspected	78,737	58,412
Total measures corrected	2,284	1,413
Total measures condemned for repair	579	564
Total measures confiscated	3,178	3,084
Total measures sealed	72,596	52,820
Total weights inspected	142,331	135,873
Total weights corrected	9,585	11,467
Total weights condemned for repair	1,041	1,335
Total weights confiscated	3,876	3,216
Total weights sealed	127,834	119,861
Total measuring pumps inspected	12,743	12,970
Total measuring pumps corrected	3,706	3,437
Total measuring pumps condemned for repair	55	979
Total measuring pumps confiscated	22	33
Total measuring pumps sealed	8,960	8,541
Total milk bottles inspected	842,314	2,176,368
Total milk bottles correct	291,078	285,737
Total milk bottles confiscated	[illegible]	4,909
Total containers inspected	883,672	1,154,987
Total containers heavy	48,048	63,268
Total containers correct	754,207	1,005,798
Total containers light	81,417	85,921
Total prosecutions	404	175
Total convictions	370	138
Total acquittals	15	12
Pending	19	4
Complaints otherwise disposed of	10,467	11,989
Total establishments visited	67,914	63,562
Total certificates issued	63,442	48,151

INSPECTION OF APPARATUS EMPLOYED IN STATE INSTITUTIONS.

Annual inspection has been made of all weighing and measuring apparatus imployed by all state institutions as per following report:

	1917		1918
Scales	98	Scales	109
Measures	22	Measures	34
Weights	403	Weights	[illegible]
Containers	13,698	Containers	[illegible]
Milk bottles	1,917	Milk bottles	[illegible]

All apparatus found inaccurate was corrected and such as was not susceptible of repair was destroyed. All variances in deficiency in containers inspected was reported to the superintendent of the institution and the co-operation of the department extended to protect the state in these as well as future purchases. The employment of the apparatus and its proper upkeep was demonstrated to those in charge of same. The fullest co-operation has been extended the state purchasing department and all matters referred has had my serious concern with the result that many thousand dollars have been saved to the state.

THE PUBLIC WEIGHMASTER ACT.

The Public Weighmaster Act defines the duties of public weighmasters, provides for rules and regulations governing the business of public weighing, and prescribes that any person, firm or corporation engaged in the business of public weighing for hire, or any person, firm or corporation who weighs and measures any commodity, produce or article, and issues therefor a weight certificate, which is accepted as the accurate weight upon which the purchase or sale of such commodity, produce or article is based, shall be known as a public weighmaster, and he is required to file a bond in the amount of one thousand dollars for the faithful performance of his duties.

Inspecting and testing Public Weighmaster's scales in Sacramento County, by James Duffy, Sealer.

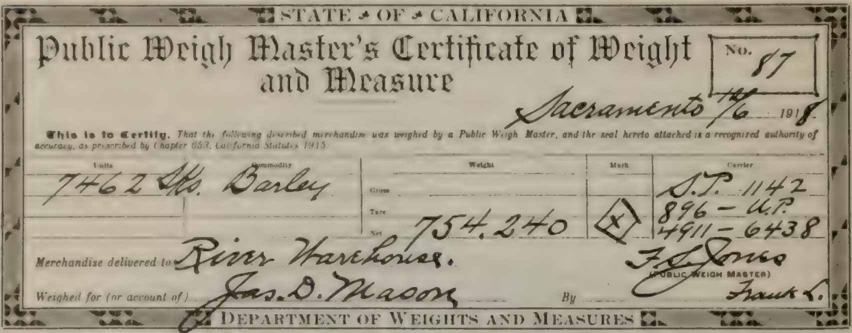
The enforcement of this law has been successfully accomplished and under the educational policy of the department has been made a vehicle for the practical and uniform adoption of the principle on which it is based. Its object has been developed with excellent co-operation and subscribed to as being a solution to the public demand that honest and accurate records of weight must form the basis of settlement between the buyer and seller.

One thousand one hundred seventy-nine persons have qualified as public weighmasters, and this department holds surety companies and personal bonds for the faithful performance of their duties, in the amount of $1,179,000.00. The apparatus employed by the public weighmasters are given special attention and must be of a satisfactory type, complying with the specifications, and must test accurately within the prescribed tolerance. A special form of report has been adopted in which the record of the inspection of the apparatus by the sealer is transmitted. By this record this department is familiar with the construction and condition of the apparatus, and able to determine the possibility of error, and aids materially in the handling of complaints.

Testing Public Weighmaster's warehouse scale at Fresno, by H. P. Jayne, County Sealer.

To the enforcement of this law this department has given more time and consideration than to any other branch of the service. The importance of the operation of this law is emphasized when you consider the magnitude of its effect. Millions of tons of the products and produce of the state are weighed on heavy apparatus for the producers by disinterested persons acting as public weighmasters, where the buyer and seller are not present to verify the accuracy of the weighings; in fact, the public weighmasters weigh the products of the state as well as the products and commodities shipped into the state.

To the farmers and producers of the state the operation of this law fills a long prayed for relief against arbitrary records of weight of produce at point of destination. The record of weight at point of origin obtained by the farmer is equally as valid a base for settlement as weights at point of destination.



STATE OF CALIFORNIA

Public Weigh Master's Certificate of Weight and Measure

No. 87

Sacramento 7/6 1918

This is to Certify. *That the following described merchandise was weighed by a Public Weigh Master, and the seal hereto attached is a recognized authority of accuracy, as prescribed by Chapter 653, California Statutes 1915:*

Units	Commodity	Weight		Mark	Carrier
7462 Sks.	Barley	Gross			S.P. 1142
		Tare			896 – U.P.
		Net	754.240	(X)	4911 – 6438

Merchandise delivered to River Warehouse.

Weighed for (or account of) Jas. D. Mason

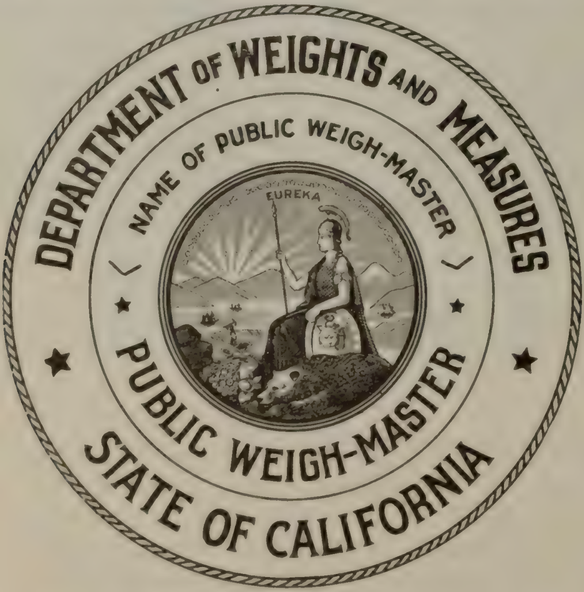
F. G. Jones
(PUBLIC WEIGH MASTER)

By Frank L.

DEPARTMENT OF WEIGHTS AND MEASURES

Form of Public Weighmaster's certificate adopted, and now in common use.

The form of public weighmaster certificate provided for in the Act is now in general use by all public weighmasters, and is today a document of great importance in the commercial world. The record of weight in the certificate is today accepted throughout the state, as well


DEPARTMENT OF WEIGHTS AND MEASURES
NAME OF PUBLIC WEIGH-MASTER
EUREKA
PUBLIC WEIGH-MASTER
STATE OF CALIFORNIA

Public Weighmaster's seal, adopted, which must be attached to all public Weighmasters' certificates.

as throughout the United States, as being the accurate record of estimation at the time that the commodity was weighed. Its employment has developed commercial confidence and removed suspicion, irritation, carelessness, and many other evils from the avenues of commercial exchange. Under its operation many erroneous trade customs and bad practices in the estimation of quantity have been effectively eliminated, and a force developed making for accuracy and honesty.

Space does not here permit to delineate the many complaints and prosecutions associated with the operation of this law. It is, however, gratifying to say that these complaints are becoming less and the necessity for prosecutions are becoming less, as the underlying principle of the law is being developed.

California has entirely overcome all Eastern tendency of the past to consider California weights and measures otherwise than accurate. The excellent co-operation obtained in the enforcement of this law is satisfactory evidence of its usefulness and permanency. It requires, however, constant vigilance in rigidly maintaining the system that has been developed, the most important feature of which is the proper upkeep of the apparatus employed. It follows that without properly constructed and accurate scales it is impossible to have accurate records of weight. The issuance of a weight certificate is just as important as the issuance of a bank check. The amount of the check is dependent on the accuracy of the weight record. An error in the latter means a loss or gain in the former. No man is entitled to a greater weight than the actual weight of the commodity weighed. The buyer and seller are, however, entitled to the honest and correct weight, and to this principle this department will continue to extend its most serious and constant concern.

MINIMUM STANDARD WEIGHT FOR CHARCOAL WHEN SOLD IN SACKS.

Charcoal is usually sold at a fixed price per sack without any declaration as to the weight or contents of same. Investigation desclosed the fact that the term, "A sack of charcoal," so far as designating any amount or quantity, was meaningless. Actual inspection of a hundred sacks showed that they varied in weight from 25 pounds to 42 pounds. In a complaint covering a delivery of ten sacks sold at $1.00 per sack the following gross weights per sack were obtained: 30, 29, 43, 35, 42, 31, 38, 25, 29, 29.

By virtue of the powers conferred under section 6 of chapter 786, amended statutes of 1917, this department may exercise this authority to determine and fix what shall constitute a sack of charcoal, thereby extending substantial protection to the public against the commitment of misconduct in the sale of this commodity and providing for merchants a uniform basis for competition.

Whenever in the state of California oak or hard charcoal is sold by the sack, such sack shall contain a minimum net weight of 40 pounds of charcoal, and 40 pounds net weight is hereby established as the minimum standard weight of oak or hard charcoal when sold in containers.

Whenever in the state of California pine, willow, or soft charcoal is sold by the sack, such sack shall contain a minimum net weight of 30 pounds of charcoal, and 30 pounds net weight is hereby established as the minimum standard weight of pine, willow, or soft charcoal when sold in containers.

Whenever in the state of California any variety of charcoal is sold by the ton, the quantity shall be equivalent to the standard ton of 2,000 pounds net weight, and all deliveries shall be accompanied with a tag or voucher indicating the variety and quantity.

The establishment of this standard will definitely prevent deception in quantity when charcoal is sold by the sack and provide a uniform standard which can be maintained by inspection.

These regulations became effective on the first day of June, 1918.

LAUNDRY WEIGHTS REGULATION.

Much agitation and many complaints over laundry weights caused an investigation to be made by this department into the systems employed by the laundries in obtaining their weights on which they base their charges.

This type of scale is illegal and not permitted for use by laundries in weighing washing for housewives.

The custom of washing clothes at so much per pound is comparatively new. It has, however, been uniformly adopted by the laundries throughout the state. Under the system all bundles of clothes are weighed at the laundry in their soiled state, and the housewife must accept such weight as her basis of settlement.

Under its powers this department desires to safeguard effectively the accuracy of the weights forming the basis of settlement, and to that end recommends that all laundry owners who base their charges for laundry washed at so much per pound shall qualify as a public weighmaster.

The Public Weighmaster Act defines a public weighmaster as any person, firm, corporation, copartners, or individuals, who shall weigh or measure any commodity, produce or article and issue therefor a statement or certificate of weight which shall form the basis for settlement between contracting parties.

The enforcement of this act is intended to safeguard the record of weight forming the basis of settlement, where such record is obtained by one of the contracting parties, the other being absent. Its operation affecting the weighing of laundry will make for uniform accuracy in weights and greater concern to the weighing apparatus employed, and will provide under the authority of the act for the issuance of an approved form of weight certificate. The record of weight therein contained shall be a true and accurate statement and the public weighmaster seal thereto attached shall be a recognized authority of accuracy as prescribed by chapter 653, California Statutes of 1915.

Any operator or owner of a laundry qualifying as a public weighmaster may appoint any person or persons without notice to this department, as deputy public weighmasters to weigh for them at any place in the state of California, such owner or operator to be at all times responsible under their certificate or appointment, for the accuracy of the weighings of persons so appointed.

They may adopt a form of weight certificate which is practical and applicable to their particular requirements. Such forms may be of any size or color. Such certificate shall be known as a state certificate of weight and shall state thereon the true net weight of the soiled laundry, the date on which it was weighed, the name and address of the owner, the name or number of the person collecting it, the name of the laundry, together with the name of the public weighmaster.

These certificates shall also contain the following statement:

> "This is to certify that this laundry was weighed by a public weighmaster, and the seal attached hereto is a recognized authority of accuracy, as prescribed by chapter 653, California Statutes of 1915."

Such certificates may contain statement of cost or other lettering necessary to make it answer the purpose of a voucher, providing that such lettering does not conflict with or confuse the purpose of the certificate as a weight record.

WEIGHT OF BANANAS.

Inspections show a variance of from five to fifteen pounds between the marked or original weights and the weight of the bananas at the time of sale, the merchant forcing the retailers to absorb this loss of weight.

The price of bananas is very fluctuating, and the handling of the commodity suggests a strong tendency for speculation. The price is influenced by the supply and demand, which is very irregular.

Bananas are a staple food commodity, and when sold by weight such weight must be the actual true net weight of the fruit at the time of sale. Any violations thereof constitute a misdemeanor under the authority of section 32 of the Weights and Measures Act.

Enforcing the standard weight of bread.

STANDARD WEIGHT OF CODFISH IN BLOCKS.

The Net Container Act under section 10 defines the meaning of the word "container" as follows:

> "The term 'container' used in this act is hereby defined to be any receptacle or carton into which a commodity is packed, or *wrappings with which any commodity is wrapped.*"

Under this provision *codfish* in blocks when wrapped in tissue paper comes within the purview of the act as being food in package form, and such wrappings shall declare thereon the true net weight of the codfish.

Extensive inspections of the weight of codfish in blocks showed an average variance in deficiency of two ounces in the two-pound block, and an average variance of one ounce in the one-pound block.

It is fair to assume that the people of California consume ten million pounds of codfish annually, which according to the known error means a loss to the consumers per annum of 625,000 pounds, which at the prevailing price of twenty cents per pound amounts to $125,000.

Standards Fixed.

Whenever in the state of California codfish is sold, offered or exposed for sale in blocks or bricks, such blocks or bricks shall weigh one pound or two pounds net, standard avoirdupois weight.

A large block of codfish within the meaning of this opinion shall be construed to weigh two pounds net, and a small block one pound net, avoirdupois wieght.

A commercial tolerance in deficiency is hereby fixed at one-quarter ounce for the large block, and one-eighth ounce for the small block.

The provisions of this opinion shall be confined to apply to packers and jobbers of this commodity, and inspection shall be confined to their premises, unless otherwise directed.

When codfish is sold, offered or exposed for sale in bundles, middles, or otherwise than herein provided, the actual true net weight shall form the basis for estimation of quantity, and there shall be no tolerance allowed in deficiency of such true net weight.

ESTABLISHING A LEGAL TOLERANCE ON HAY AT TIME OF STORAGE.

Section 6 of chapter 786 of the amended statutes of 1917 provides in part as follows:

> "The State Superintendent of Weights and Measures may establish a standard net weight of any commodity, produce or article, and prescribe such tolerance for same as he may in his best judgment deem necessary for the proper protection of the public. Any person violating such standards or tolerance shall be guilty of a misdemeanor."

Acting in accordance with and under the authority of this provision, I do hereby fix and establish 2,000 pounds as the legal standard weight of one ton of hay, and prescribe for such legal weight a commercial tolerance not to exceed forty-five (45) pounds per ton, and on individual bales of an approximate weight of 225 pounds a tolerance not to exceed five (5) pounds per bale.

The tolerance as herein fixed shall apply to hay when weighed in for storage, in public warehouses, and deduction of such tolerance shall be clearly noted in all public weighmaster weight certificates issued therefor, which record of weight shall be accepted as the true weight, forming the basis for settlement.

Any seller of hay, having allowed the legal tolerance, shall be exempt from further responsibility of variance upon a reweigh, providing that such variance is caused by conditions over which he, acting in good faith, had no control.

All public weighmaster certificates of weight for hay, on which the legal tolerance has been allowed, shall state thereon the words, "A tolerance of forty-five pounds per ton allowed," or "A tolerance of five pounds per bale allowed," and such tolerance shall be construed to compensate for all loss in handling, evaporation, and other natural losses associated with storage, shipping, and handling of the hay.

Rule for Measuring Hay in the Stack.

There is no national or state enactment establishing a legal method for determining quantity of hay when in the stack. The following method has, however, been adopted, and has proven a greater accuracy than the many methods suggested.

The width and length of the stack shall be measured and the distance from the ground against one side of the stack to the ground against the other side of the stack, directly over and opposite, shall be taken in linear feet and inches, and then the width shall be substracted from the measurement over the stack as above indicated, the result divided by two, and the result so obtained multiplied by the width, and the result thus obtained multiplied by the length, which will give the number of cubic feet contained in the stack, and the tonnage shall thereupon be determined by dividing the total number of cubic feet by the number of cubic feet constituting a ton as follows: 422 cubic feet shall constitute a ton of clean native mountain hay after thirty days and up to three months settlement in the stack; but, when same shall have been over six months in the stack, 340 cubic feet shall constitute a ton. As to all other kinds of hay after the same shall have settled in the stack from sixty days up, 512 cubic feet shall constitute a ton of alfalfa or rough slough grass after the same shall have been in the stack thirty days and up to one year; 450 cubic feet shall constitute a ton of clean timothy and clover hay after the same has been in the stack thirty days and up to one year.

SWEET POTATO OPINION.

Sweet potatoes when packed in crates is food in package form within the meaning of the California Net Container Act, as well as the federal amendment, and must therefore declare on the crates or containers a statement of the weight of potatoes therein contained.

Diligent effort has been made by the producers to pack sweet potatoes in uniform sized containers and to employ a crate of a uniform standard tare. A late inspection of 422 crates shows an average gross weight of 115 pounds, and an average net tare of 12 pounds, or an average net weight of 103 pounds. We find, however, that in the southern part of the state the growers employ a smaller sized crate with a less tare and consequently a less net weight.

These circumstances would defeat the practicability of establishing a legal standard weight for sweet potatoes when packed in crates until such time as the packers develop greater uniformity in the adoption of the standard sized container.

Inspections and experiments further disclose that sweet potatoes are subject to unusually heavy shrinkage due to evaporation. Such evaporation varies from one per cent to as high as seven per cent.

Another circumstance affecting the weight of sweet potatoes in crates is that when potatoes are packed there is a tendency for the sand in which they grow to cling to the product and such sand is inclined to fall during handling and during transit, causing a variance in deficiency of the declared contents.

In order to compensate for these circumstances the shippers purchasing the sweet potatoes from the growers have, by mutual agreement, made weight deductions from the weight of the product.

A careful review of these circumstances suggests the opinion that in view of the fact that these conditions are known to all growers and packers of the commodity, it would be manifestly unfair to penalize the buyers and, ultimately the consumers, with a loss due to shrinkage and sand adhesion.

The producers are, however, under all circumstances entitled to a protection against arbitrary deductions and without prejudice to them, this department is of the opinion that the deduction of an amount not to exceed two per cent is sufficient to compensate for the variances due to the circumstances set forth.

Under section 6 of the Weights and Measures Act the state superintendent is given the power to prescribe commercial tolerances affecting the weight of common commodities, which he, in his best judgment may deem necessary, and said section further provides that any person violating such tolerances shall be guilty of a misdemeanor.

Under the authority and by virtue of these powers, I therefore fix and establish a tolerance not to exceed 2 per cent on the weight of sweet potatoes when packed in crates.

I beg to further recommend that in declaring the contents on crates of sweet potatoes that the prefix or term, "minimum contents," be used, and that such declaration or designation must approximate the actual quantity of sweet potatoes in the crate.

I further beg to recommend that in your inspection of the weight of sweet potatoes in crates, that you determine the contents on the average weight of not less than five (5) crates, and that such inspections be made at the packing houses or points of general distribution.

Using Steelyard in Weighing Cotton. These devices are inspected and when sealed may be used. Their employment is, however, restricted to weighing of bulky commodities.

OPINION FIXING A LEGAL STANDARD WEIGHT FOR MILL PRODUCTS.

On March 17, 1916, a conference was held in San Francisco, at which there were present the representatives of the majority of the firms engaged in the milling industry. This conference carefully considered the standardization of mill products in uniform weights, extensively reviewing all circumstances attending the packing and marketing of same, and recommended that uniform standards of weight be legally established.

Subsequent to this conference and during January of 1918 the milling industry of the state expressed their desire and signified their willingness to adopt a uniform standard weight for *flour, shorts, bran* and *rolled barley*.

In considering the establishment of these standards the practical interests of the milling industry and their effect as a protection to the purchasing public were carefully considered. Their enforcement and general adoption will unify competition without discrimination.

Actuated therefore by these principles and by virtue of the power vested in me, I herewith fix and establish the following standards of weight as legal standards of weight when these commodities are sold in sacks or other containers, towit:

Flour.

One barrel of flour shall contain 196 pounds net weight.
One-half barrel of flour shall contain 98 pounds net weight.
One-fourth barrel of flour shall contain 49 pounds net weight.
One-eighth barrel of flour shall contain 24½ pounds net weight.

Shorts.

Packed in containers shall weigh 80 pounds net weight.

Bran.

Packed in containers shall weigh 60 pounds net weight.

Rolled barley.

Packed in containers shall weigh 75 pounds net weight.

In packing these commodities the same shall be packed net weight exclusive of the weight of the container, and where there is not a legal moisture contents established, the packers shall at the time of packing make a reasonable allowance of weight in excess of these standards to compensate for shrinkage due to evaporation of moisture contents.

There shall not be any tolerance prescribed for these standards and it shall not be held to be a violation of these standards when any commodity herein standardized is sold or offered or exposed for sale in containers and there is a discrepancy or variance between the standards herein fixed and the actual quantity of the commodities in the containers, provided that such discrepancy or variance is due to unavoidable leakage, shrinkage, evaporation, or causes beyond the control of a person acting in good faith.

These standards shall be in force and effect on February 1, 1918. They shall not be construed to affect any shorts, bran, or rolled barley packed prior to the first day of February, 1918.

In fixing these standards due and proper consideration has been given to the necessity of conserving the economic employment of sacks.

The packing or marketing of any of these commodities herein standardized in containers in conflict with these standards constitutes a misdemeanor as provided for under section 6 of the Weights and Measures Act.

You will kindly give the enforcement of these standards your constant and careful concern.

STANDARD WEIGHT GALLON OF MILK.

This department has fixed the net weight of raw milk at 8.60 pounds per gallon. In estimating quantity of milk by avoirdupois weight, 8.60 pounds per gallon shall be the legal net weight of milk per gallon, and there shall be no tolerance allowed.

A string of false measures condemned before they became the medium of fraud in avenues of trade.

SPECIFICATION AND TOLERANCES FOR ICE SCALES.

In your inspection of spring balances, commonly known as "Ice Balances," and employed in the sale of ice, you will apply the following specifications and tolerances, which have been promulgated and adopted by this department.

No. 1. All graduations shall be clear and distinct, and equally spaced.
No. 2. The maximum value of the graduations shall not be greater than 2 pounds.
No. 3. The greatest interval between the graduations shall not be less than .04 inches.
No. 4. The indicator shall be firmly attached, and reach to the graduated divisions.
No. 5. That part of the indicator which reaches to the smallest subdivisions shall not exceed the width of these subdivisions.
No. 6. The distance between the indicator and the reading face shall not exceed .12 inches.
No. 7. No device to alter the working or effective length of the spring shall be placed on the outside of the scale.
No. 8. Ice balances of this type shall be freely suspended from the ring when in use.
No. 9. On inspection of apparatus of this type, same shall be accurate within the tolerance not to exceed one-half of the first graduation.

These specifications shall apply to all apparatus of this type manufactured in the state, or brought into the state after the promulgation of these specifications.

SPECIFICATIONS AND TOLERANCES FOR AUTO MEASURES OR FUNNEL CANS.

In order to facilitate the delivery of gasoline, coal oil, and other petroleum products, where the automatic measuring devices are not available, or where same are condemned for repairs, the persons engaged in the sale of these products have provided themselves with what is known as an "*auto measure*" or "*funnel can*," usually made of galvanized iron, equipped with spout for pouring and handle to convenience carrying.

This utility has been commonly adopted, and in the opinion of this department is a liquid measure coming within the regulations of the Weights and Measures Act, and as such shall be subject to the following specifications:

No. 1. Liquid measures of this type shall be made of metal, enamel ware, composition, or similar or suitable material, and shall be of sufficient strength and rigidity to withstand ordinary usage without becoming bent, indented, distorted or otherwise damaged.

No. 2. They shall be of a capacity of one gallon, or a multiple of one gallon, and not to exceed a capacity of five gallons.

No. 3. Measures of this character constructed with a filling neck shall be so constructed that the capacity is determined by a definite ring or indentation in the filling neck not to exceed one-quarter inch from the body top of the measure. Measures of this character constructed with a hood and provided with a lip or overflow, shall be so constructed that the capacity is determined by a definite indentation encircling the measure.

No. 4. No measures of this character shall be subdivided and the only reinforcement rings which may be used are those which are firmly attached to the outside of the measure or impressed in the measure, and do not by such rings or indentations show divisions for lines in the surface of the measure which may be construed as or mistaken for graduations.

No. 5. If the measure is provided with a tap or spigot, the construction shall be such that the measure will be completely emptied by the tap or spigot while it is standing upon a level surface.

No. 6. When a lip or rim designed both to facilitate pouring and to receive any overflow is provided, the measure must be so constructed as to hold its full capacity, exclusive of the lip or overflow, while it is standing upon a level surface.

Tolerances.

The tolerances to be allowed in excess of deficiency on all measures of this character, shall not be greater than the tolerances provided for liquid capacity measures.

These specifications and tolerances shall be in force and effect on and after this date.

Educational exhibit of false weights and measures condemned by Clarence E. Tucker, Sealer for Stanislaus County.

POTATOES IN CONTAINERS.

To All Weights and Measures Officials
of the State of California.

Gentlemen: Potatoes when sold in sacks, lug boxes, baskets, or other containers, is food in package form within the meaning of the Net Container Act, and when potatoes are sold, offered or exposed for sale in containers *at retail,* such containers shall declare thereon a statement of contents in accordance with the requirements of the Net Container Act.

Acting in conformity with the provisions of section 6 of chapter 786, amended statutes of 1917, I hereby fix 100 pounds net weight as the minimum weight of a standard sack of potatoes, and whenever potatoes are sold, offered, or exposed for sale in the state of California, such sacks shall contain not less than 100 pounds net weight of potatoes, and whenever the term ''sack'' is mentioned indicating quantity in the sale of potatoes, such term shall mean not less than 100 pounds net weight, and there shall be no tolerance allowed below this standard weight.

The fixing of this standard will effectively prevent the sale of potatoes under the designation of a sack by persons who intentionally avail themselves of a common custom to defraud the public. Common custom and usage attending the sale of potatoes in sacks has determined quantity in excess of 100 pounds, and where designing persons with intent to defraud, deliberately shrink the sack in the center, cut it off at the bottom, stovepipes it, or in other ways reduce the cubical contents of the standard size potato sack, thereby causing contents of same to vary from 70 to 100 pounds, such conduct violates the principle of honest and legitimate competition and constitutes commercial deception.

These tactics have a demoralizing influence on legitimate business and are a commercial deception, which the operation of the weights and measures laws aims to prevent.

Fresno County educational fair exhibit tells a silent story.

TRANSFER OF JURISDICTION OF CONDEMNATIONS.

Apparatus that has been condemned for repairs by a county sealer of weights and measures in any county of the state of California, and, in order that same may be repaired, it becomes necessary to transfer it from one jurisdiction to another, the sealer shall permit this transfer, but the apparatus shall be returned to the original point from whence it came, and there released under the authority of the sealer in whose jurisdiction it was originally condemned.

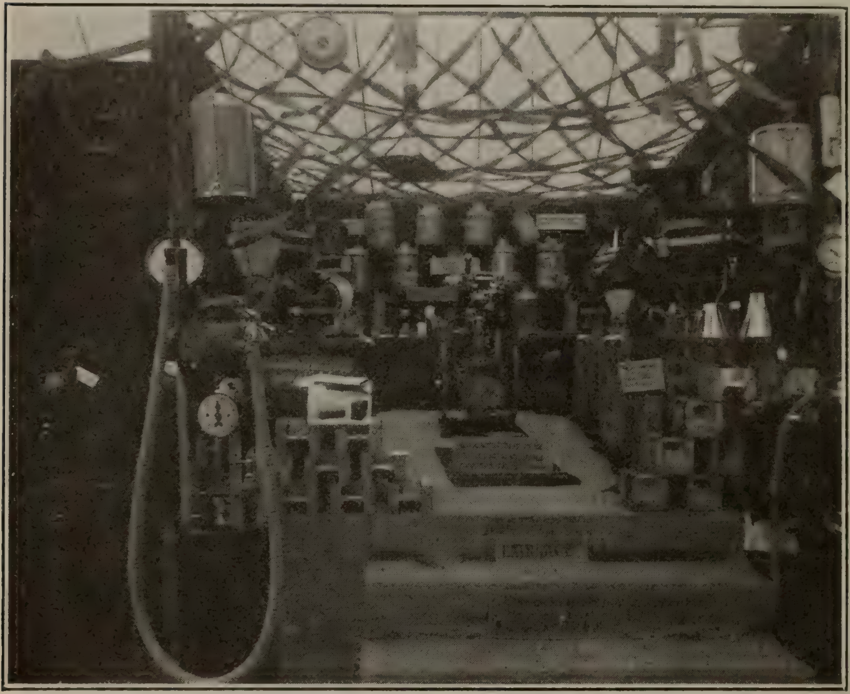
When apparatus is condemned for repairs, and same shall have been transferred into another jurisdiction in order that same may be repaired, and where the owner of the apparatus requests that same be retained permanently in the jurisdiction to which it was transferred, he shall notify the Sealer in whose jurisdiction it was condemned, and the Sealer may exercise the option of granting this privilege or withholding it. In the event that he grants the privilege, he shall notify the sealer in whose jurisdiction the apparatus is being repaired, and transfer his authority to this sealer, with his request that the apparatus be released when same shall be repaired, and forward the condemnation tag to the county sealer in whose jurisdiction the apparatus was condemned, together with the report of same. If apparatus is confiscated, the same shall be destroyed by sealer into whose jurisdiction it was sent for repairs.

WEIGHTS AND MEASURES
The Youngest Department of Our County Government. Get Acquainted
HONESTY IN TRADE
MANY A MICKLE MAKES A MUCKLE
THE OLD WAY
CALIFORNIA
STEP
STATE STANDARDS

Educational fair exhibit in Riverside County. George W. Wing, Sealer.

EDUCATIONAL WORK.

The educational work of the department has always been considered important and has proven the most sensible medium of obtaining co-operation, thereby minimizing the necessity for court procedure and adjustments of controversies.



Kern County educational fair exhibit of devices that will cheat no more.
L. H. B. Farr, Sealer.

During the past two years I have availed myself of all opportunities to address commercial bodies and farmers gatherings on the subject of weights and measures and on all occasions my address has had large and attentive audiences.

The county sealers have availed themselves of the county fairs to prepare educational exhibits and have distributed pamphlets dealing with their work. These exhibits were calculated to present effectively the useful work of the departments without impugning or reflecting on the reputations of those whose apparatus was condemned and which formed a part of the exhibit.

The moral which our educational exhibits develops is an effective force in the avenues of trade. The influence of the work is not restricted nor is it confined to any particular person or body of men. It holds out to every man, woman and child in our state a protection and a safeguard, making it thoroughly a people's department, in which all are concerned.

Exposition Park educational exhibit, prepared by Charles M. Fuller, Sealer for Los Angeles County.

SMOKED MEAT WRAPPINGS.

The sale of smoked meats by gross weights or including in the weight of the smoked meat the weight of the wrappings constitutes under the provisions of the weights and measure law a misdemeanor.

Our consistent efforts to obtain compliance with this demand has not met with the success hoped for and the subject will have our special attention at the earliest date possible, when the necessary steps will be taken to enforce the law along lines which will result in full observance.

Twenty-nine ounces of paper wrappings included in the weight of three pieces of bacon at time of sale, at the price of the bacon. The purchaser paid approximately 90 cents for useless wrappings, advancing the cost of bacon approximately 7 per cent.

Inspection of butter by Lawrence J. Dolan, sealer for San Francisco County, has developed a uniform observance of the standard weights, safeguarding the public against short weight in this common commodity.

AMENDMENTS.

The amendments recommended will be confined to clarifying the several laws and making them more workable without adding any additional powers or extending the service beyond its logical and definite sphere of activity.

The Weights and Measures Act fixes the compensation for the chief deputy at $1,800 per annum and I desire to most earnestly recommend that the law be amended fixing his salary at $3,000. This amendment is justified by reason of the fact that his duties have been extended both in volume and in responsibility.

The present deputy, Mr. Chas. F. Hayden, has applied himself diligently and successfully and it is in recognition of his efficiency that I recommend this increase in his compensation.

During the past two years the standardizations of common commodities have proven effective as a protective and economic advantage to the producer and consumer alike. These standardizations have been possible under the present powers of the Weights and Measures Act, which powers are sufficient to promulgate and develop this principle along educational lines. They do not, however, provide for any restriction for their violation, and I beg to recommend that where such standards have proven their usefulness that a special act of the legislature on the subject providing for the necessary penalties be enacted.

This also applies to certain rules or methods for the estimation of quantity which have become popular by uniform adoption but which have no legal foundation for their existence. The most important of these is legalization by legislative act of the "standard cord" as a measure of quantity in the sale of wood, and the uniform standardization of the common building brick.

The underlying principle and practical purpose of the Public Weighmaster Act has been developed during the past two years with success and satisfaction, and has proven a relief to controversy and complaint in the estimation of the weight of bulk commodities and has developed a system of public weighing resulting in great harmony and commercial confidence. As the result of the practical operation of this law the amendments recommended thereto will remove certain conflicting provisions and make the law more comprehensive and workable.

IN CONCLUSION.

In putting into operation regulations relating to the accurate estimation of quantity, I have determined their usefulness and helpfulness, and their economic effect by proper experiments and careful investigations.

In order to accomplish the uniform employment of accurate weighing apparatus, it was necessary to develop a process of elimation of the old antedated types and in their place effect the installation of apparatus whose construction gave guarantee of accuracy. Much of the old apparatus has been repaired and reinstalled.

The manner of installation is of equal importance to construction. All wagon scales and auto truck scales are today installed on concrete instead of timber and in every case possible the pit is of concrete construction. In the development of commercial reforms and the elimination of erroneous trade customs, I have not permitted any suspension of the activities of the department respecting the inspection of weighing and measuring devices and I contend advisedly that the weighing and measuring apparatus today employed in the state of California are uniformly accurate within the prescribed powers, and of types consistent with the legal specifications.

Harmony and co-operation together with tact have consistently been deemed necessary in the successful development of the service and this policy will be adhered to in the future. I have found education and the application of lenient measures more productive of the best results than prosecution and have vigorously demanded from all persons associated with the service a disinterested and impartial administration.

The liberal powers extended under the act have only been applied to the best interests of the people and have enabled the department to sustain its dignity and in no instance, to my knowledge, has any official exceeded these powers or applied them erroneously. Each official has been of special concern to me to the end of developing in him the highest standard of efficiency.

If in the course of the time passed I have failed in the sum total of what may have been expected it was alone due to the limitation of human energy, for I have consistently and fearlessly done my duty in accordance with the dictates of my conscience, ever mindful of the trust and confidence of the people whom I serve.

Respectfully submitted.

CHAS. G. JOHNSON,
State Superintendent of Weights and Measures.

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